RAILROAD GAZETTE

FRIDAY, SEPTEMBER 20, 1901.

CONTENTS

Contributions

The Guayaquil & Quito Railway.

The Guayaquil & Quito Railway Company,
Guayaquil, Ecuador, S. A., Aug. 26, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

I have seen an article in your issue of July 26, 1901, entitled "The Guayaquil & Quito Railway," and dated June, 1901, signed by "W. H." We, of course, have no idea who "W. H." is, but his numerous mis-statements and colossal ignorance of the country, lead us to believe that he has either never been in Ecuador at all, or that if he has he has never been outside of the Harbor of Guayaquil. While we have no desire to enter into any controversies with reference to the road which we are operating and building in Ecuador, we do not care to let some of his statements pass unnoticed.

He states that one train a day leave Duran at 9:30 a.m., and arrives at Bucay at about 6 p.m. There are regularly one passenger and one freight train from each end of the line daily, with ferry facilities to Guayaquil. The trip of the regular trains requires about five hours. There are, in addition to these trains, numerous trains carrying construction material.

The old line from Duran to Chimbo, which was acquired from the Government of Ecuador, has been entirely rebuilt and new rails laid upon it. The continuation of the line leaves at a point two miles to the west of Chimbo, known as Bucay Junction, crosses a divide between the Chimbo and Chanchan Rivers, thence passes up the Chanchan River Valley until it crosses the western cordillera of the Andes to the Palmyra Pass, a distance of 49 miles from Bucay Junction. The new line is being built at a gage of 3 ft. 6 in., and the gage of the old line will be changed within the next two or three months to the same gage.

Your correspondent states that all of the construction work was abandoned over a year ago, owing to a defect in the location. Under the former contract between the Government and the Railway Company, the latter was prohibited from exceeding a grade of 3 per cent., except in special cases, when it could use a grade of 4 per cent.; and the line was located under these conditions. Construction was begun on this line, but in order to secure the necessary development for such a grade, the line was thrown well up on the side of the mountain. A short time after beginning construction on this line, slides of such serious nature occurred on the mountain side as to convince the engineers of the company that the road could not be maintained if built; and they, therefore, recommended that the line be thrown down in the Chanchan River Valley, where a firm and solid roadbed could be obtained. In order to do this, however, it was necessary to increase the gradient, which was done by agreement with the Government of Ecuador, approved by an act of the Ecuadorian Congress.

The engineers were moved on to this new line on April 1, 1900. The first 27 miles of the grading on this line (which includes three tunnels) is just reaching completion, and the track is laid and the road in operation for construction purposes for 14 miles of this distance. Beyond the 27th mile the road to the town of Guamote, a distance of 60 miles, is under construction, the grading being about two-thirds completed.

The track-laying has been somewhat slow, on account of the numerous crossings of the Chanchan River, which necessitates heavy bridging. We expect, however, to put the road in operation as far as Guamote next spring. When this is done, the interior of Ecuador will be in direct railroad communication with the coast.

The Chanchan River Valley is quite narrow, and in places becomes a canyon very similar to the canyons of the Colorado River, and there is much heavy work in the construction of the road, the excavation on a few of the miles reaching as much as 98,000 cu. yds. of solid rock. The maximum grade is 5½ per cent., the maximum curvature 29 degs., which is only used when absolutely necessary. The Baldwin Locomotive Works, of Philadelphia, have constructed for us a number of engines specially designed for this service. There are four of these engines at present successfully in operation on the road.

Considering the difficulties of the country, and the long distance we are from home we consider that remarkable progress has been made in the construction of this road during the past year. All construction material and rolling stock has been imported from the United States, and the labor from Jamaica.

In rising from the coast to the top of the western cordillera at Palmyra Pass, we overcome an elevation of 10,625 ft. Beyond Palmyra Pass to Quito, the road runs through a well cultivated, thickly populated, rolling country. The road reaches its greatest elevation, about 12,500 ft., where it crosses the Sanancajas Pass, at the base of Chimborazo. From Palmyra to Quito the road runs between irregular lines of volcanic peaks, perpetually snow-capped; as many as 11 being in sight at one time.

JOHN A. HARMAN,
Chief Engineer and General Manager.

Legal Regulation of the Engineering Profession.

[At the last annual convention of the American Society of Civil Engineers there was a discussion of this topic. This discussion is printed in the August issue of the *Proceedings* of the Society and we give below an abstract of it.]

Do the interests of the profession, and the duty of its members to the public, require that only those who are competent be allowed to practice as Civil Engineers?

Under what authority, through what agency, and upon what evidence of competency, should applicants be admitted to the practice of Civil Engineering?

Samuel Whinery, M. Am. Soc. C. E.—Taking up these questions in the order stated, the first relates to the interests of the members of the profession to themselves and to each other. The facts about the present situation are undisputed. Any man who chooses may assume to practice civil engineering. . . . That this condition of affairs is anomalous need not be argued. Neither in any other profession nor even in the well-established trades are similar conditions tolerated. . . . In this country, the great profession of engineering, in its several branches, is almost alone in being open to the pretender and the quack.

Do the interests of the profession of civil engineering require a change in this respect? The question may be viewed in two principal aspects. The first and least worthy may be called, to put it in its most sordid light, the selfish aspect. It is based on the right of self-preservation. In these days, to be a competent civil engineer implies a large amount of special education and training. Whether the education is acquired within or without the technical schools, does not matter. However acquired, it must be supplemented by training and skill, which can only be obtained through actual experience. Both the education and the experience cost money. They represent a large part of the capital invested in the business. It may fairly be claimed that this capital is equitably entitled to the same protection as is that invested in other lines of business. On mere commercial grounds alone, the man who invests money in any lawful business may reasonably expect and demand the protection of the law in all proper ways. The particular quality of the protection afforded will vary with the nature of the business. The merchant not only expects and receives protection from the thief and the burglar, but he is likewise entitled to protection from the nefarious competitor who sells goods under false names, or misrepresentations, or who appropriates his trade-marks. May not the civil engineer who invests money or its equivalent in his professional business demand equal protection from the unfair competition of the quack who marks the goods he offers with counterfeit labels, and thereby is enabled to steal a part of the business that rightfully belongs to the *bona fide* engineer? . . .

The other aspect of the question is more attractive because it rests on higher grounds than mere self-protection or commercial necessity. Its basis is love for and loyalty to the profession. This is not the place or the time to enlarge on the usefulness and the dignity of that profession. Every true and worthy member of it holds it in the highest honor and is properly jealous of its good name. It is a name under which may be marshalled most of the world's greatest benefactors in the material progress of the human race. We are unwilling that its honor shall be tarnished or its usefulness limited by the actions of those who have no right to be numbered in its ranks, though they may assume its name. That the profession is being dishonored and its good name discredited by the actions of self-styled civil engineers, who have neither the necessary qualifications to practice it nor the common honesty to admit their incompetence, is a fact that every civil engineer knows so well that it is quite unnecessary to go into particulars. . . . No one will assert that it is not the duty of every worthy and loyal member of the profession to protect its good name from this source of danger and dishonor. There should be, therefore, no dissent from the answer that the interests of the profession do demand that some effective method be adopted to prevent the incompetent from assuming to practice civil engineering.

To the second division of the question, relating to our duty to the public, the answer should be equally clear. The admitted facts are: That at present the public has no ready means of determining whether a man who poses as a civil engineer is competent or incompetent, and that, in the absence of such knowledge, it is often imposed upon by the charlatan.

Civil engineering, while it has been practiced throughout all ages, under other names, has been, until quite recently, without professional organization, and without well-defined limitations. The public, or a large part of it, has not been educated to appreciate either the natural or acquired qualifications necessary to constitute a competent civil engineer, or to discriminate between the real and the pretended. . . . That we owe a duty to the public in this matter must be so obvious to every right-minded man in the profession as to require no argument. As well might it be contended that the physician owes no duty to the public when he sees a plague existing, or impending, which his professional knowledge and experience teaches him how to stop or prevent. From the standpoint of good citizenship alone, we have no right to stand silently by while out fellow-citizens are defrauded or when their lives and property are threatened. We now come to the second branch of the topic:

Under what authority, through what agency, and upon what evidence of competency, should applicants be admitted to the practice of Civil Engineering?

Here we arrive at the first ground, in the discussion of the topic, where there may properly be difference of opinion. . . .

The important requisites, in any scheme adopted for the regulation of the practice of civil engineering, are: That it should be simple, capable of efficient enforcement, and as free from the possibility of individual injustice as it can be made. In this last respect, it would be better to err in the direction of liberality than in that of unnecessary restriction. From the nature of our government, it is impossible to secure national action in the matter, and the several State legislatures alone must be looked to for the necessary legislation; and it must be recognized that nothing short of State legislative enactment will meet the requirements of the case. It is very desirable that such enactments in the several States should be as nearly uniform as possible.

With these conditions in mind, the writer would suggest that the efforts of the profession be directed toward securing, in every State of the United States, the adoption of suitable acts regulating the practice of civil engineering. It is hardly necessary to say that the proper framing of such acts will be a matter of great importance, and the best talent of the profession, aided by good legal counsel, should have a controlling voice in their preparation.

The following outlines briefly the requirements which, in the writer's opinion, should be embraced in such a legislative act:

First.—It will be necessary to define accurately the meaning of the term "Civil Engineer" and to differentiate broadly and yet carefully the occupations which come under the head of practicing the profession. This will be by no means an easy task, as every one will recognize.

Second.—A State Board of Examiners should be created, whose duties it will be to examine applicants for licenses to practice civil engineering within the limits of the State. This board may consist of five members, chosen from among men of recognized standing in the profession, three members constituting a quorum. They should be appointed by the Supreme Court of the State, in order to avoid, as far as possible, any political influence in the appointments. The members of the board should receive a reasonable annual salary, and their traveling and other necessary expenses should be paid out of the general funds of the State. Their term of office should be for a considerable number of years, say five, and the term of one member should expire each year. The board should meet at stated times and places, after due notice, to examine and license applicants.

Third.—The licenses issued by the board should be of three classes. Third class licenses might embrace graduates from the civil engineering course of technical colleges of good standing, who have had little or no actual practice, and those applicants who have not graduated from such colleges, but who are found, upon examination, to be competent to survey lands, build common roads, inspect work in progress—in short, those who are just beginning the practice of the profession, and those whose ability and attainments justify practice in only the more simple work of the profession.

Licenses of the first class should be issued only to those members of the profession, who, by marked ability or long experience in any branch of civil engineering, have attained a good degree of eminence in the profession. Licenses of the second class should be issued to

those intermediate between the third and first classes, as the law may designate, and as the examining board may determine. . . .

Fourth.—No person should be permitted to practice civil engineering in the State without a license duly issued by the board, and methods of procedure against violators of the law should be prescribed, and appropriate penalties provided. . . . The law should not apply to members of the Engineer Corps of the U. S. Army, or to civil engineers of the U. S. Navy, when engaged in governmental work, but those engineers should not be allowed to engage in private practice without a license.

Fifth.—The board should be authorized to revoke any license for good cause, such as immoral or unprofessional conduct; or to substitute for a license of a higher class one of a lower class, for good cause shown. . . .

William R. Hutton, M. Am. Soc. C. E.—If the public is to be fully protected, as has been suggested, it will be necessary to have periodical examinations to define the grade of work for which each engineer may be competent.

I see nothing to be gained by the passage of this resolution. We must define what constitutes an engineer. If the Tredgold rule is applied, certain members of this Society will be excluded who are highly scientific men, as well as others who cannot be thus classed. Civil service examinations are a protection in the matter of public works. Promoters of private works rarely neglect to ascertain the qualifications of an engineer before engaging him. A certificate or license to practice would not be accepted without investigation as to competency.

J. F. Wallace, Past President, Am. Soc. C. E.—The proposition seems impracticable. The inability to get uniform regulations in the different States, and, above all, the difference in the degree of our professional qualifications and in the requirements, make it so. The law and the principles of law are well understood. Lawyers can be licensed; ministers of the gospel can be licensed by their denominations, because all that is required is that they shall subscribe to certain tenets and have a general education. Men in the trades can be licensed. But as to engineers, the qualities that underlie the successful engineer, and the character of his work are so varied, and our profession demands such a variety of talent, that I do not see that it is practicable to accomplish our object by such a license. If it is desired to engage a civil engineer for a particular piece of work, it would not be enough to employ one who simply had a license to follow the profession of engineering. It would be necessary to know the characteristics of the man, and whether he was adapted for the particular work in hand. It does not seem that the man, or the corporation, requiring particular qualifications for a particular place, would be assisted by a license system.

Edward A. Bond, M. Am. Soc. C. E.—Our friend Mark Twain, in discussing the question of who should be allowed to practice medicine, said, relative to the proposed prohibition of the practice of certain kinds of treatment, certain Swedish movements, etc., that he never had had any inclination to be treated in that way until this discussion came up. When he found that he could not be treated that way he wanted to be treated that way. Now, in regard to the case of the civil engineer, it is questionable whether it is wise to try to secure legal formalities to keep certain men from attempting to practice that profession. In our country when a keen business man is in need of an engineer for any particular service, he sends for one, looks him in the eye, weighs him up, and in less than seven minutes knows whether he wants that man or not. He does not care whether that man has a license to practice the profession of civil engineering; but he judges of him by looking into his eye, by talking with him and finding out what his experience has been, and with that he is satisfied, and it is pretty sure that he is not going to make a mistake.

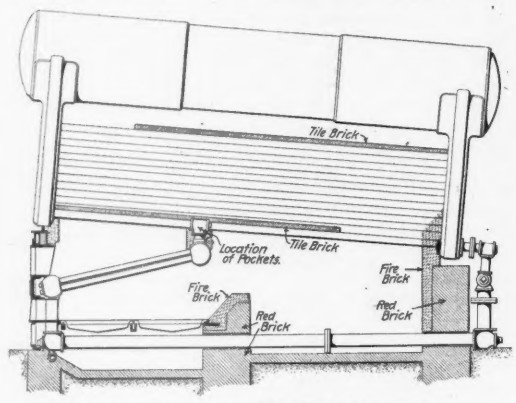
Pocketed Tubes in a Heine Safety Boiler, with Hawley "Down-Draft" Furnace.

BY HOLSTEIN De HAVEN BRIGHT.

A peculiar case of pocketed tubes was recently found in two 510-h.p. Heine boilers at the Baldwin Locomotive Works, after the removal of a Hawley "down-draft" furnace. This boiler and furnace are here shown, with the side wall of the furnace removed. As the name implies the draft on the upper grate is downward, thus drawing the heat from the front end of the bottom row of tubes.

The Hawley furnace has an upper grate formed of 36 water tubes, about 6 ft. long, placed in two horizontal rows, and staggered in their relation vertically, connecting two 10-in. drums as shown. The rear drum is connected to the front water leg of the boiler by six short tubes. On the rear drum fire-brick are laid, extending to and covering about 10 in. of the bottom row of tubes. At this section, after the fire-brick had been removed, pockets developed on 12 tubes.

The Hawley furnace was installed Jan. 28, 1900, and was removed July 25, 1901; a grate of the ordinary type being put in its place. When the Hawley equipment was removed the six short tubes were taken out, and new tubes were substituted. The 12 old tubes were examined and found to be free from pockets or cracks. The boiler was fired at 4 p. m., Wednesday, a low and even fire being maintained. At 9 o'clock the following morning water was discovered blowing from one of the lower row of tubes. The fire was immediately drawn, and upon examination, the entire row of tubes, with the exception of the six new ones, were found to contain from one to three pockets each, and three splits ranging from ⅝ in. to 1 in. in length, the injuries being confined to the parts previously protected by fire-brick.



Boiler and Furnace—Side Wall Removed.

Following is the date on which each old tube was inserted, and the extent of injuries. All tubes were Allison-made, charcoal iron. The count is taken from left to right, facing the front of the boiler:

Injuries to Water Tubes.

Tubes.	Date.	Defect.
No. 3	Sept. 19, 1900	3 small pockets.
No. 4	Sept. 19, 1900	1 large pocket.
No. 6	Sept. 19, 1900	1 ex. large pocket.
No. 7	Sept. 19, 1900	1 small pocket.
No. 9	Sept. 19, 1900	1 ex. large pocket; 1 split 1 in. long.
No. 10	Jan. 28, 1900	1 large and 1 small pocket.
No. 12	June 24, 1900	2 small pockets.
No. 13	Jan. 28, 1900	2 large and 2 small pockets.
No. 15	Jan. 28, 1900	2 large pockets.
No. 16	Jan. 28, 1900	2 large and 2 small pockets; 2 splits.

A parallel case occurred the same week, only on a smaller scale. Another 510-h.p. Heine boiler was changed from "Hawley Down-draft" to plain hand-fired grate. In the second instance the fire was not under the tubes as long as in the case of the first boiler, and, in consequence, only four tubes were pocketed and one split. As in the first case, however, the pockets developed only where the tubes had been previously protected by the fire-brick over the drum.

Compound Locomotives on the Buenos Ayres Great Southern.*

The question of coal consumption of locomotives becomes in countries like the Argentine Republic, which depends entirely on the imported article, a matter of paramount importance, and endeavor to secure economy in this respect led to the trial of the compound engine. The type of engine adopted on the Great Southern Railway was the two-cylinder Worsdell and Von Borries, as being the simplest arrangement, and interfering least with the duplication of parts of the standard simple engines previously in service. All these engines, both simple and compound, were built by Messrs. Beyer, Peacock & Co., under the instructions of Messrs. Livesey, Son & Henderson, the company's consulting engineers.

The first compound engines were erected in 1889, and the results obtained were so excellent that, with the exception of shunting and local traffic engines, no simple engines (either goods or passenger) have since been ordered.

The engines proved easy to handle, exhibited a high economy in coal and water, and, owing to the reduced demand on the boiler, showed less tendency to priming and scale than the original simples. As an offset against these advantages, the first compounds sometimes showed a sluggishness in starting, or an inclination to jib, due to the rapidity with which the automatic Worsdell and Von Borries starting valve caused compounding to take place, reducing the power by cutting off the live steam from the low pressure cylinder before (in the case of long and heavy trains) the whole weight was fully taken on the drawbars, or the whole train in motion. In this valve the exhaust steam from the high-pressure cylinder is held in check by a mushroom valve, which closes automatically by the action of live steam from the boiler, admitted to a pair of small pistons operating on the back of the large mushroom. With this valve closed, no high pressure exhaust steam can pass, and the low-pressure cylinder is temporarily fed by a by-pass of live steam from the boiler. The high-pressure exhaust being completely bottled up, compounding takes place very rapidly, as the back pressure rising forces open the large mushroom and shuts the by-pass. The defect was got over by an improvement made in the Company's Works at Buenos Ayres in introducing a hollow spindle in the mushroom valve with an escape passage to the chimney, the office of the passage being to relieve the high-pressure back pressure to some extent, and so delay compounding.

The effect of the alteration in the intercepting valve was to entirely obviate the tendency to jib previously experienced, and to insure a certain and easy start, with the maximum power, whilst retaining the automaticity of the valve's action, a most valuable and important feature, putting it out of the power of the driver to work non-compound longer than absolutely necessary, which by some systems is possible, and tends to reduce the economy. This hollow spindle arrangement was found so successful that the intercepting valves of the whole of the compounds—some 109 engines—were so fitted.

The tabular statement attached shows the coal and lubricant consumption, and also the comparative cost of repairs for the mileages given.

In the comparison of the cost of repairs it must not be forgotten that this is as between the simple and compound engine only. The cost of wages in Buenos Ayres is at present about 50 per cent. more than in England, and the material, although imported duty free, has to bear several extra charges, such as freight, packing, insurance, etc., that greatly enhances its cost when delivered to the company's workshops in Buenos Ayres.

The absence of heavy grades on the Buenos Ayres Great Southern Railway renders it a favorable field for the compound engine, the grades of importance being in one district only, the bulk of the line being practically straight and level. The character of the traffic, with long runs and full trains as a rule, causing an approximation to the fixed load of a stationary engine, is also favorable for the compound system.

Consumption of Coal and Lubricants—1900.

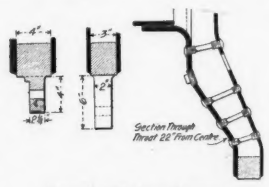
	Passenger engine. Simple. Class 6.	Passenger engine. Compound. Class 6A.	Passenger engine. Compound. Class 6B.	Goods engine. Simple. Class 7.	Goods engine. Compound. Class 7A.	Goods engine. Compound. Class 10.
Coal per train-mile, lbs.	36.00	28.05	29.25	55.68	45.00	40.50
Weight of trains, tons..	162	166	211	624	585	526
Axles per train.....	25	25.5	32.5	96	90	81
Coal per axle per mile, lbs.	1.44	1.10	0.90	0.58	0.50	0.50
Lubricant per 100 train-miles, lbs.	7.70	6.45	6.28	7.13	7.27	5.96
Lubricants per 100 engine miles, lbs.....	6.38	5.96	5.96	5.57	5.96	5.32
Ratio of coal per axle per mile	100	76.4	62.5	100	86.2	86.2

Repairs (General and Maintenance).

	Passenger engine. Simple. Class 6.	Passenger engine. Compound. Class 6A.	Goods engine. Simple. Class 7.	Goods engine. Compound. Class 7A.
Number of engines repaired	32	24	22	43
Repairs per engine on mileage shown.	£510	£470	£498	£470
Engine-miles run for above repairs	51,034	55,865	54,769	55,224
Engine-miles run per annum	23,916	28,920	20,556	25,692

Atlantic Type Passenger Locomotives—Chicago, Milwaukee & St. Paul Ry.

The Baldwin Locomotive Works have about completed nine Atlantic type passenger locomotives for the Chicago, Milwaukee & St. Paul, considerably larger than any now used on that road. They are Vauclain compounds and will weigh about 6,000 lbs. less than the Class I Atlantic type engines of the New York Central, illustrated Feb. 1. The principal features of the design and the boiler and frame details are illustrated herewith.



Front Water-Space.

The total weight, in working order, is about 170,000 lbs., with 90,000 lbs. on the driving wheels. The cylinders are 15 and 25 in. x 28 in., driving wheels 84 in. in diam., and the working steam pressure is 200 lbs. The boilers are of the wagon top type and have 190 sq. ft. of fire-box heating surface, and 3,008 sq. ft. of tube heating surface, making a total of 3,198 sq. ft. The grate area is 40 sq. ft., the fire-box being 8 ft. 6 in. long x 5 ft. 5⅞ in. wide. The tender weighs, in working order, about 120,000 lbs. and has a capacity for 7,000 gals. of water and 9 tons of coal.

The general specifications are as follows:

Description.

Gage	4 ft. 8½ in.
Simple or compound	Compound
Fuel	Illinois soft coal
Weight on drivers	About 90,000 lbs.
Weight, total	About 170,000 lbs.
Weight, tender loaded	About 120,000 lbs.

General Dimensions.

Wheel base, total, of engine	27 ft. 11½ in.
Wheel base, driving	7 ft. 3 in.
Wheel base, total (engine and tender)	57 ft. 5½ in.
Length over all, engine	45 ft. 11 in.
Length over all, total, engine and fender	68 ft. 7 in.
Height, center of boiler above rails	9 ft. 5½ in.
Height of stack, above rails	14 ft. 11 in.
Heating surface, fire-box	190 sq. ft.
Heating surface, tubes	3,008 sq. ft.
Heating surface, total	3,198 sq. ft.
Grate area	40 sq. ft.

Wheels and Journals.

Drivers, diameter	84 in.
Drivers, material of centers	Cast steel
Truck wheels, diameter	36 in.
Trailing wheels, diameter	54 in.
Journals, driving axle, size	9 x 12 in.
Journals, truck axle, size	6 x 10 in.
Journals, trailing axle, size	8½ x 12 in.
Main crank pin, size	6 x 6½ in.

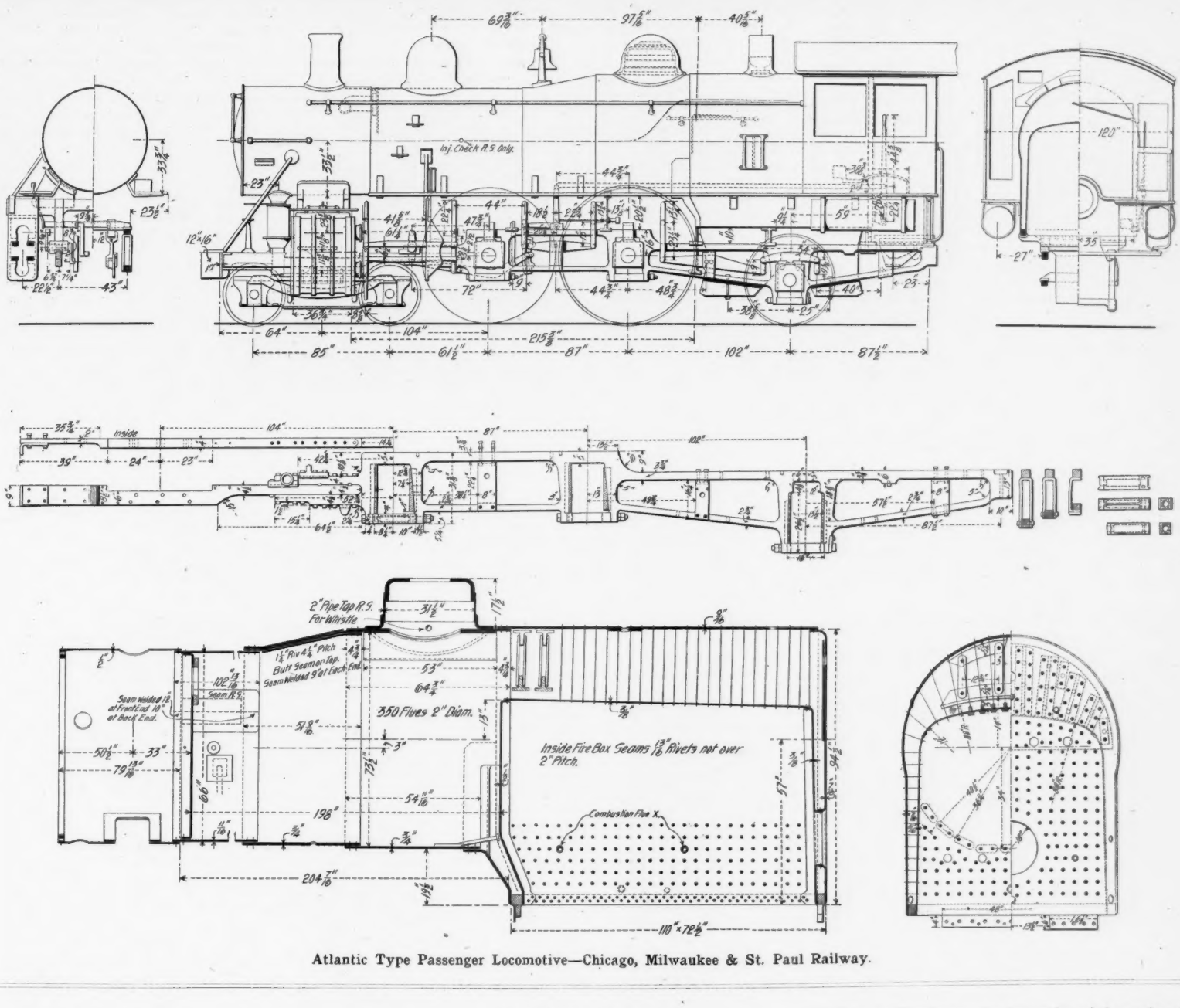
Cylinders.

Cylinders, diameter	15 and 25 in.
Piston stroke	28 in.
Piston rod, diameter	3¾ in.
Kind of piston rod packing	United States Metallic
Main rod, length center to center	11 ft. 4 in.
Steam ports, length	Circular, 34 in.
Steam ports, width	1½ in.
Exhaust ports, length	Circular, 34 in.
Exhaust ports, width	4½ in.
Bridge, width	2¾ and 3 in.

Valves.

Valves, kind of	Balanced piston.
Valves, greatest travel	5¼ in.
Valves, outside lap	H. P., ¾ in.; L. P., ⅝ in.
Valves, inside clearance	H. P., ⅛ in.; L. P., ¼ in.
Valves, lead in full gear	H. P., 0; L. P., ⅛ in.

*Abstract of a paper by R. Gould, read at the International Engineering Congress, Glasgow.



Atlantic Type Passenger Locomotive—Chicago, Milwaukee & St. Paul Railway.

Boiler.

Boiler, type of	Wagon top
Boiler, working steam pressure	200 lbs.
Boiler, material in barrel	Steel
Boiler, thickness of material in barrel	11-16 and ¾ in.
Boiler, diameter of barrel	66 in.
Seams, kind of horizontal	Sextuple riveted
Seams, kind of circumferential	Double riveted
Thickness of tube sheets	½ in.
Thickness of crown sheet	⅜ in.
Crown sheet stayed with	Radial stay
Dome, diameter	31½ in.

Fire-Box.

Fire-box, length	8 ft. 6 in.
Fire-box, width	5 ft. 5⅞ in.
Fire-box, depth front	70¼ in.
Fire-box, depth back	64 in.
Fire-box, material	Steel
Fire-box, thickness of sheets	5-16 and ⅜ in.
Fire-box, brick arch?	Yes
Fire-box, water space, width. Front, 4 in.; sides, 3 in.; back, 3 in.	
Grate, kind of	Rocking and drop plate

Tubes.

Tubes, number	350
Tubes, material	Iron
Tubes, outside diameter	2 in.
Tubes, length over sheets	16 ft. 6 in.

Smoke-Box.

Smoke-box, diameter	67 in.
Smoke-box, length	83½ in.

Other Parts.

Exhaust nozzle	Double
Exhaust nozzle	Permanent
Exhaust nozzle, diameter	3¼, 3½, 3¾ in.
Exhaust nozzle, distance of tip below center of boiler	2 in.
Netting	Wire
Netting, size of mesh or perforation	3 x 3 in.
Stack	Straight
Stack, diameter	18 in.
Stack, height above smoke-box	2 ft. 8 in.

Tender.

Type	Eight-wheel swivel trucks
Tank capacity for water	7,000 gallons
Coal capacity	9 tons
Kind of material in tank	Steel
Thickness of tank sheets	¼ and 5-16 in.
Type of under-frame, wood or iron	Wood
Type of truck	Barber
Truck with swinging motion or rigid bolster	Rigid
Type of truck spring	Coil
Diameter of truck wheels	38 in.
Diameter and length of axle journals	5 x 9 in.
Distance between centers of journals	76 in.
Diameter of wheel fit on axle	6⅜ in.
Diameter of center of axle	5⅜ in.
Type of truck bolster	Barber
Type of truck transom	Barber
Length of tender frame over bumpers	290 in.
Length of tank	264 in.
Width of tank	118 in.
Height of tank, not including collar	73 in.
Type of back drawhead	Munton M. C. B. coupler
With or without water scoop	Without

Fire Risks of Railroads.*

The fire waste to railroad property in the United States during the year 1899, according to the "Chronicle Fire Tables," was $3,216,560. This sum does not include the loss occasioned by many small fires, reports of which are not published. That proper precautions are not always taken, and wise regulations enforced, to reduce the fire risk of railroad properties is not surprising in this era of specialism. Fire occurs from all but incredible causes. The most common to railroad properties are: Sparks from locomotives; spontaneous combustion; defective chimneys; faulty electric wiring; carelessness; kerosene oil lamps; gasolene; fuel oil; sparrows' nests; sawdust spittoons; surreptitious smoking; improper setting of stoves; steam pipes; air pipes; movable gas and lamp fixtures; hot bearings; matches and accumulation of rubbish. With many of these causes the mention of them suggests methods of avoiding the effect.

Sparks from Locomotives.—Keep roofs in good repair, particularly coal houses and coal storage sheds. Remove punky or rotted boards or shingles. Remove the sparrows' nests. The danger from sparks is that they start a fire slowly, and the engine and employees are usually gone when it breaks out. Examine front ends regularly and often; not through the peep hole, but open up the front end. Do not patch the netting. When it is defective renew it.

Spontaneous Combustion.—That vegetable oils when minutely divided, as on waste, rags or sawdust, ignites spontaneously is an accepted fact. Car oil, kerosene, gasolene, benzine, or any mineral oil will not ignite spontaneously. The dangers from oily waste, carelessly scattered about a roundhouse or shop, is not only that it assists the rapid spread of fire, but you cannot tell when there may be mixed with it waste or rags saturated with an oil that will ignite spontaneously. In nearly every shop and roundhouse, paint materials are used, and the linseed oil used in mixing it is the incendiary material. Special precautions should be taken in paint shops to avoid accumulation of oily waste, old overalls or junk of any description. Discharge a foreman who, after receiving instructions to the contrary, permits the practice. It is not necessary. Do not permit a locked cupboard in the paint shop or the painting section of the roundhouse. Require regular inspection of the cupboards by the foreman. Require that overalls and jackets be hung up where air can circulate freely about them. Do not permit oil barrels to be set upon boxes or other raised support that is boxed in; the arrangement should be such that inspection can be readily made under and around them, and so that you can see what becomes of the drippings.

Bituminous coal, carrying excessive quantities of sulphide of iron, will ignite spontaneously when stored away wet. The best way to handle it is to shovel out the heated mass. Do not put water on it if it can be avoided. Have storage sheds well ventilated. Do not store in piles over 7 ft. high without providing for ventilation through the center. Powdered charcoal will ignite spontaneously when in large masses.

Calcium carbide, while it will not ignite spontaneously, will, when brought into contact with moisture, give off very rapidly a very inflammable and explosive gas—acetylene. It should have a separate building for its storage and be kept dry. Mention is made of this, as some railroad companies are now using acetylene gas for headlights and in cars. The heating of unslacked lime, when wet, is well known. It should be kept in a dry place.

Defective Chimneys.—Chimneys should be inspected at least once a year. The danger from defects is greatest at the point where the chimney passes through the roof. If it sets over on the roof, as is sometimes done to save flashing, or if any of the roof timbers are set into the chimney for purpose of support, any settlement of the building cracks the chimney directly under the roof boards. It is therefore essential that depot chimneys be inspected in the attic. Cut away all wainscoting or other woodwork 6 in. from the pipe and soot pan openings, and bring to a flush finish with cement or mortar. See that all unused pipe openings are closed with a metal stopper—not with a board or stuffed with paper. Require brick chimneys for roundhouses. It may seem in some cases that the value of the building is not sufficient to warrant the expense of a brick chimney; but keep in mind that engines are worth from $7,000 to $10,000 each, and that they are damaged by having even a worthless house burn over them. Do not run a stovepipe into an engine jack, as is sometimes done in small engine houses. It is particularly dangerous. Do not have the stove pipe enter a chimney vertically; always use an elbow. This avoids the danger of burning soot

*Extracts from a paper by Mr. W. S. Worman, Fire Inspector Chicago & North Western, presented before the Western Railway Club, September 17, 1901.

falling from the chimney, also back drafts from blowing fire from an open stove door.

Faulty Electric Wiring.—This subject cannot be here treated exhaustively. If the installation is over five years old, or if you have had grounds or short circuits which you cannot locate, or any other trouble for which you do not know the cause, refer the inspection to an expert. Insulation and fuses are extra precautions, but there is no reason why the installation should not be perfect without them. In making inspections consider the electric current as a heat producer. The heat is most intense where the current encounters the most resistance. Next treat the wires as bare; the insulation is simply an additional precaution. Pay especial attention to the mechanical execution of the work, careful and neat running of wires, connecting, soldering and taping, and attaching of fittings. Do not call upon the tinsmith or boilermaker to install the electrical equipment, or to make extensions or changes to the one already in. Have it done by an electrician who knows his business. Rules have been formulated for safe wiring, and tests made of materials at a great expense by the National Board of Fire Underwriters. These rules and reports of approved materials are distributed gratuitously. Do not assume the wiring is all right because it works well. When new work is installed by contract, stipulate that it shall be in accord with the rules and requirements of the National Board of Fire Underwriters. Then take the usual precautions to see that the work is up to contract.

Carelessness.—The prevention of fires from carelessness is largely a matter of discipline. Look out for it in the tin shop, to my mind one of the most dangerous departments of railroad plants. See that proper care is taken of gasolene and charcoal firepots, that they are not carelessly set away in closets before cool. Notice how your men dispose of their torches, particularly in roundhouses. I have noticed many wooden cupboards, the inside of which have been charred by hot torches. Note what disposition is made of hot ashes. Note the general order and cleanliness of the building. Be particularly careful in the shops where you have not had a fire for 30 years or more. Long immunity from fires seems to have a tendency toward carelessness.

Kerosene Oil Lamps.—Require that these be filled and trimmed by daylight only. Provide facilities for this and the storage of the oil supply, in a separate building if practicable. Provide dry sharp sand to take up oil drippings. Have the stand where lamps are filled and trimmed set out at least 6 in. from any woodwork. Keep all oil cans securely corked. Do not allow accumulation of materials or rubbish around or over the stand where lamps are cared for. Provide an iron can to keep the oily waste in. Empty kerosene and gasolene barrels are sometimes productive of fires. They are nearly always full of an explosive vapor, especially after standing in the sun.

Gasolene.—Gasolene gives off an explosive gas at ordinary temperature. Great care must be exercised in handling it in buildings. Require separate, well ventilated buildings for its storage. Buildings should be ventilated at the floor as well as the roof. The gas is heavier than air. Be careful with gasolene tire heaters. Place a check valve on both the inlet and outlet pipes. Require entire disconnection from air when not in actual service. When gasolene gas is used, as in car shops, see that air pressure is relieved every night. Have a cut-off valve in gas pipe outside of but near to the building. Of course, have a cut-off at the carburetter also. Ascertain how much gasolene is kept in cans in the tin shop, and benzine in the paint shop; how it is cared for; whether the keeping of more than one day's supply in the building is avoidable. If you discover any of the cans uncorked, or gasolene or benzine in open vessels, for washing brushes or other purposes, give the foreman the benefit of your professional advice, and his shop the benefit of a further inspection. Gasolene is always ready for business, and performs it promptly when the conditions are right.

Fuel Oil.—Much that has been said of gasolene applies with equal force to fuel oil. When it is inside the building you have a very inflammable, and, when heated, explosive agent. Arrange the apparatus to avoid the possibility of flow of oil into the building except as used. Do not pin your faith entirely upon one valve, especially if it is in close proximity to the burner. Do not feed by gravity pressure. Do not feed direct from a main supply tank of large capacity under air pressure. Have a supplemental tank outside the building, but near to where oil is used; the supplemental tank to be filled from the main supply tank. Feed the burners from the supplemental tank. Lay the pipes to the burners so they will drain back to the supplemental tank. Have a cut-off valve outside. Relieve the pressure from the supplemental tank every night. Be particular about this, or you will have the dangers of a gravity tank. Look at the location of the main supply tank, and consider whether in case of accident or leakage there is danger from the flow of oil towards the buildings.

Sawdust Spittoons.—Do not permit their use anywhere. If you must have spittoons, fill the boxes with sand.

Smoking.—This is a matter of discipline. Better prohibit it in the shops at least. It is probably the best you can do anyway. Do not allow the men to "light up" in the building before starting for home. The danger, of course, is in proportion to the laxity of discipline, and arises from smoking surreptitiously.

Improper Setting of Stoves.—Stoves should be free from cracks and have perfect doors over the ashpit as well as the fire pot. Floors should be protected by zinc, or an iron pan with an air space under it. Brick are not so safe. They should not be nearer unprotected woodwork than 2 ft. Protect exposed woodwork with bright tin or zinc which reflects heat. It is better than iron. If you use stoves in any of the woodworking shops, look out for the dust that settles on the upper surface of the stove pipe. Pipes should be riveted at joints and well supported. See that there is no woodwork within 6 in. of them where they pass through partitions.

Steam Pipes.—There is considerable skepticism as to the danger from steam pipes, but the danger is there just the same. While steam pipes will not always set fire to boards or clothes carelessly laid upon them, they will heat and char such material, and it is only a question of confining the heat when fire will ensue. It is an erroneous idea that a high degree of heat is necessary under all conditions to ignite ordinary combustible materials. The inspection of this hazard will be found laborious, but that of convincing workmen of the dangers more so. The number of well authenticated cases of fires originating from steam pipes are numerous. Keep the pipes free from woodwork, allowing an air space where they pass through floors, walls and partitions. Do not permit accumulation of material or dust on the pipes or on or behind radiators. Do not permit the pipes or radiators to be used as drying racks, in fact, treat them as a stove. When a pipe is hot enough to be uncomfortable to the bare hand, it is dangerous to have combustible material in contact with it. Have steam pipes in plain sight.

Air Pipes.—Air pipes, particularly in close proximity to the compressor, may become as dangerous as steam pipes. The following, within my own experience, is a curious instance of fire from this cause. A battery of pipes used for distributing air for operation of switches became coated on the inside with oil from the cylinder of the compressor. The pipes became sufficiently hot to ignite the oil inside the pipes, although the battery was over 100 ft. from the compressor. As the pipes were attached to the exterior of a brick wall in open air, no damage resulted other than the destruction of the iron pipes and disablement of the switching apparatus. In another case, however, the pipe became red hot at an elbow in close proximity to the compressor, and set fire to the surrounding woodwork.

Movable Gas and Lamp Fixtures.—Protect these with stops, to prevent swinging under or against inflammable material. This is a quite common cause of fires.

Hot Bearings.—While these may not be entirely avoided, the bearings can at least be kept free from oily accumulations, which spread a fire rapidly. Bearings in wood-working shops should be examined every night after shutting down.

Matches.—The old "seven-day" match, or those that light only on the box, are the safest. It is dangerous to permit workmen to keep ordinary parlor matches in the drawers of their work benches, the sliding motion of which, in opening or closing, frequently igniting them. They should be kept in metal boxes in the store rooms.

Accumulation of Rubbish.—Do not permit it in any of the buildings. Look out for it, particularly in freight houses. It has a bad moral effect. If you must preserve the junk, build a shed for it; but usually, if material is usable, there is or should be a proper place for it; if not, it should go to the scrap pile. If there is anything in the shop or depot building, or freight house, that is not necessary in the conduct of the business carried on in the building, get rid of it. The trouble is, if you allow the accumulation, although it may at first look innocent, the corner or out-of-the-way place in which the pile starts, soon becomes the dumping ground for anything the workmen may want to get rid of handily. Sooner or later, you will have conditions ripe for spontaneous combustion.

Fire Extinction.—For depot buildings, coal houses and freight houses, my practice is to have each building equipped with at least one barrel of salted water and a bucket. Three pails of salt should be dissolved in each barrel of water. This will keep it from freezing in the coldest weather when inside a building, but you must see to it that the salt is dissolved. Locate the barrel near the door and keep it free from accumulations of freight or other material. A round bottom bucket is recommended. The barrel of water and bucket, although one of the simplest, is one of the best equipments for small stations. For large freight houses the fire pail pump is an excellent hand apparatus. This is nothing more than a large tin pail (holding about 5 gals. of water) with a small submerged pump in it, with a short hose. Its advantages are that it requires no skill to operate it; can throw water overhead, which is very important; is easily transported through a yard to burning cars; does not corrode and is not patented. They are used quite extensively, and cost about $5 each. The fire hazard of freight houses is low, should not be greater than a dwelling house, and there is no excuse for so many of them burning.

Roundhouses.—If there is a wash-out pump, be sure and provide a hose connection at the pump, with a sufficient quantity of hose on a reel at the pump to reach any part of the house. Do not forget to have a nozzle attached to the hose, and do not permit its use for washing out, filling boilers, or any other than fire protection purposes. It is useless to provide any of the buildings or shops with fire protection devices of any kind, unless they are looked after and cared for. Provide engine houses with ladders to the roof. Block engines at the wheels nearest the doors, instead of under the drivers. This has been demonstrated as practicable, and you will find it very serviceable in removing an engine if the building is well ablaze. It is well to advise the men as to the value of steam as a fire extinguisher. Frequently an engine is alive in the house with a sufficient steam supply to extinguish a fire if the house is so constructed as to confine it.

Shop Plants.—In general, there should be both inside and outside protection. For inside protection, assuming you have plenty of water and power, I like 1½-in. hose connections, with 50 ft. or less of linen hose at each upon a reel, and attached ready for instant service. Connections should be so distributed that all parts of the building can be reached by a stream of water. The connections should not be upon a pipe smaller than 2 in. The hose and vale thread of this size is standard, and there is no difficulty in buying the equipment, including the reels. Do not spend money for this equipment, however, unless you have a constant pressure of not less than 20 lbs. upon the pipes. If conditions are such that you cannot get the hose service, do not forget the barrels and buckets. Some chemical extinguishers are very good, if taken care of and the men trained how to use them, but my experience is that they are shamefully neglected, as a rule, and that the men are often afraid of them. Hand grenades are not as good as a bucket of water. In the paint shop, oil room and parts of the plant where oil is stored or drawn, be sure to have pails of dry, sharp sand. Paint the pails red, and mark them "For Fire Purposes." Then tell the men that sand is one of the best things for extinguishing oily fires.

Apparatus for Outside Use.—If you have not a good permanent water supply, do not spend much money on it. The best thing to do is to buy a chemical engine and drill your men to use it. If you have a good water supply, see if your pump and steam plant are so housed that it will not be involved in the burning of the building or buildings you are aiming to protect. Keep in mind that when a fire gets to a stage where you must fight it from the outside, you have a very serious proposition on your hands. Probably the most you will be able to accomplish will be the protection of adjacent property.

Private Organization.—This is a vexed subject. You certainly cannot train all of your help, and yet it is clear that your protective apparatus is useless unless some concerted use can be made of it. It seems reasonable, however, that every shop should have some one, the foreman or his assistant, who shall know what fire apparatus there is, and shall keep it in good condition. He should also select some of the men from each department and drill or instruct them as to action in case of fire. The following are general suggestions: Select men likely to be permanently employed; take those whose homes are in closest proximity to the plant when practicable. Always take the watchmen. Organize your night force. This is very important. Distribute the selection as greatly as possible over your entire department. Do not give the men the idea that you are trying to make firemen of them. Do not permit any horse-play in the handling of the apparatus or at drills.

Drills should be simple, consisting principally of the running out of a length of hose from a hydrant to the building where the men being drilled are employed, and the opening up of a stream through one or two of the inside connections. Use different hydrants and different connections at each drill. Give the men time enough and require them to take care of the hose properly after the drill. It must be thoroughly drained and dried and returned to its reel.

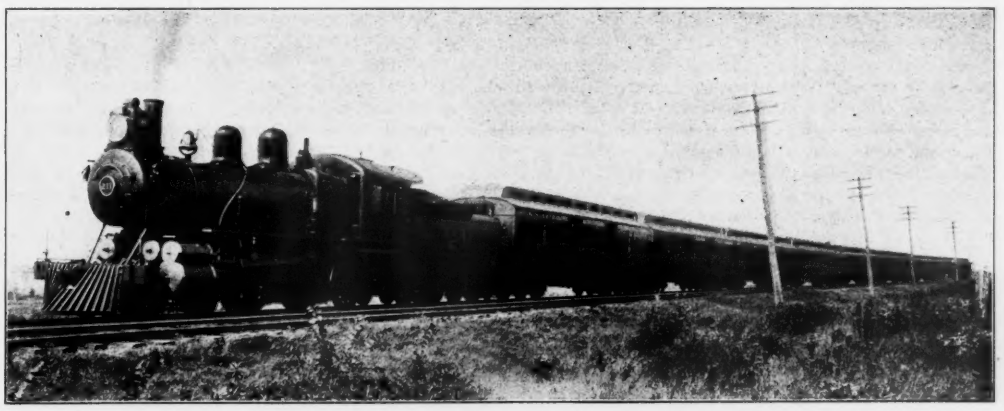
It is, perhaps, more satisfactory that the men be remunerated for drills than that their services be voluntary; say time and a half during one hour's drill. The remuneration is a useful lever for the maintenance of proper discipline and is in many ways more efficient than a voluntary one combined with some special benefit.

Every selected member should be made acquainted with the working of all the different appliances, etc. Educate them to the idea that the best results are obtained while the fire is young, and that quickness, without demoralization, is the very essence of the best service; that when an alarm of fire is given, they are expected to *get there* quickly, but quietly and coolly, and be able to handle the apparatus to the best advantage. Particularly, drill the night watchmen in the quick handling of the inside hose and the location of the fire alarm boxes. Do not permit any racing at drills, nor competition between selected men of different divisions or departments. Furnish each chief and each of his assistants with blue prints, showing water system, hydrants and fire alarm boxes, to be framed and hung in the office of each.

General Order and Cleanliness.—The only general rule is not to have anything about that cannot show some good reason for its presence. Ordinary dirt and accumulations are not always inflammable or liable to spontaneous combustion, but you never can tell what day something may be mixed up with it that is. The value of cleanliness in preventing fires applies to every part of the plant. It not only removes nearly all the causes of spontaneous combustion, but brings about a double inspection service, first from the sweepers, and second from the foreman, who sees that the shop is clean. As a moral effect cleanliness improves the pride and caution of employees. It is a matter of habit and men disciplined to it will do better and more work.

The Royal Train of the Canadian Pacific.

We give a few engravings from photographs of the train built in the shops of the Canadian Pacific Railway at Montreal for the use of Their Royal Highnesses, the Duke and Duchess of Cornwall and York during their Canadian tour. This train consists of the day coach Cornwall and the night coach York, for the especial use of their Royal Highnesses; the compartment car, Canada; the sleeping cars, Australia, India and South Africa; and the dining car, Sandringham—together with cars for the baggage, and for the railroad employees—nine coaches in all. This train is finished outside in natural mahogany, this being standard on the C. P. R. At either end of each car, and on both sides of the train are the armorial bearings of the Duke of Cornwall and York. The train is vestibuled throughout and is lighted by electricity, the Gould system of electric car lighting having been selected. The lamps are all placed behind shades of cut glass, set in the ornamental work of the ceilings. Telephones of a new pattern have been installed in every coach—one novelty being an arrangement by which all the instruments may be in use at the same moment, without any one of them interfering with any other. This train will be used on the Royal progress from Quebec to Vancouver and return to Halifax. The Cornwall will be the rearmost coach of the train, so that their Royal Highnesses may have an uninterrupted view of the scenery through which the train will pass.



The "Royal" Train of the Canadian Pacific.

The Cornwall is 78 ft. 6½ inches in length. It contains reception room, boudoir, dining room and kitchen. The reception room is paneled in Circassian walnut, and while it is undecorated save for a few ornamental moldings, it gives the effect of extreme richness. The ceilings are finished in dead gold, and the moldings and ornaments are just touched with gold and blue, the decorations being of the Louis XV. style. The hangings are of dark blue velvet, while the floor is carpeted with a heavy Wilton of gray-green. The sofa, arm chairs and other furniture are upholstered in blue velvet. The piano is of Canadian manufacture. One feature of the car is its admirable light and airy appearance, this being due to the eight large plate glass windows of the side, together with the glass panels of the door and rear wall.

The Duchess' boudoir is between the reception and dining rooms. Its prevailing shade is a pearl gray. The panels are painted a la Watteau. The lattice work of the ceiling, by which ventilation is secured, as well as the ornaments of the panels are touched with gold. The draperies are of light blue moire silk, and divans, chairs, and table are gilt to match the panels.

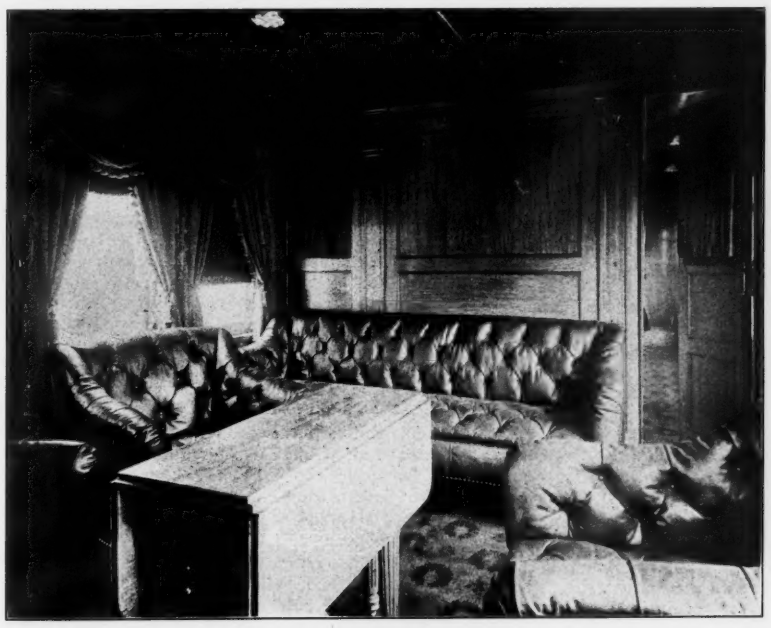
The dining room is finished in African Coromandel, ornamental cartouches in bas relief displaying at one end the armorial bearings of the King, and at the other the blended coats of arms of the Duke and Duchess, while the arms of the Dominion, and the family badge of the Duke embellish the remaining walls of the room. The draperies are of green velvet, and the decorations of the panels are in shades of gold and green to match. The upholstering is of a warm, brown tone. The dining table is large enough to accommodate eight persons.

The night coach York is 78 ft. 2 in. in length. A corridor extends throughout the length of the car. The central portion of the York is occupied by two bedrooms with servants' sleeping rooms adjacent. These Royal bedrooms are finished in pearl gray enamel; being paneled in silk to match the draperies. Each contains its own wardrobe, dressing table and large mirror. The brass bedsteads are gilt. In addition to the ceiling lights, each room has a special fixture for the dressing table. The draperies of the Duke's room are of crimson silk armure, and those of the Duchess of pale blue moire. The furniture is of satinwood.

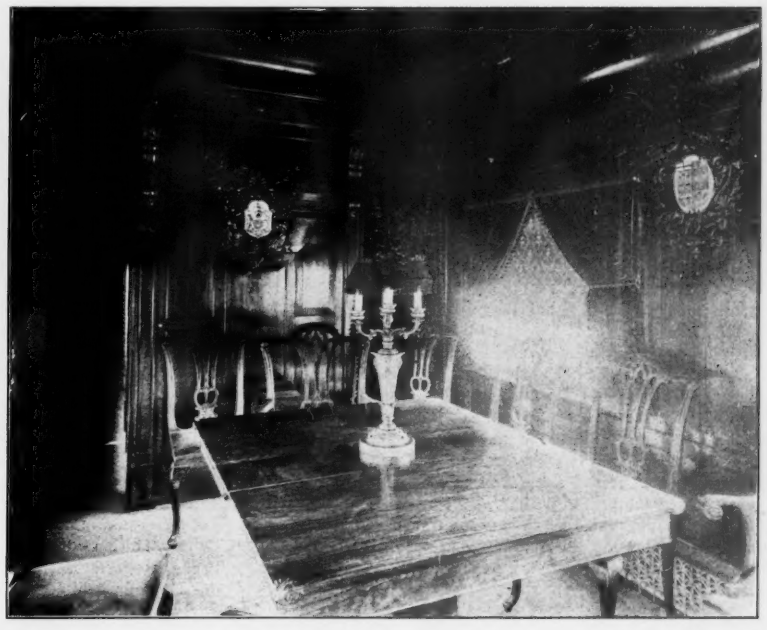
Each of the Royal bedrooms has its own bathroom attached. These are draped in a soft, tasseled waterproof cloth of a pearl gray hue. The baths are full sized, upholstered round the borders with this same waterproof cloth, and have heavy curtains of a similar material. The remainder of the car is devoted to two state rooms finished in mahogany; the one for the lady in waiting, the other for the gentleman in waiting, together with a general toilet, and a baggage room.

The Canada, which is the third coach from the rear of the train, is a compartment car, finished in prima vera or white mahogany, and upholstered in terra cotta and olive green plush. The Canada contains six state rooms, a commodious smoking room, a bath at one end of the car, and at the other a large lavatory and shower bath. The shower bath is installed in a small chamber, and it is upholstered in gray waterproof cloth.

The Sandringham is the dining car for the staff, and consists of the main dining saloon, pantry and kitchen. It is 77 ft. 2 in. long. The dining room is finished in red mahogany; the ceilings are embossed in old gold; and the floor is carpeted with a soft, green Brussels. Thirty persons can be seated at the tables. The upholstering of the chairs is leather. The other cars which make up the train are the standard of the Canadian Pacific Railway. Certain changes have, however, been made in the South Africa, inasmuch as in addition to the usual staterooms, a consulting and dispensing room have been provided for the use of their Royal Highnesses' medical attendant and his assistant. Two baggage cars complete the train. Each contains berths and accommodation for attendants, but while one has a large amount of space for baggage, a great portion of the other has been fitted up for cold storage.

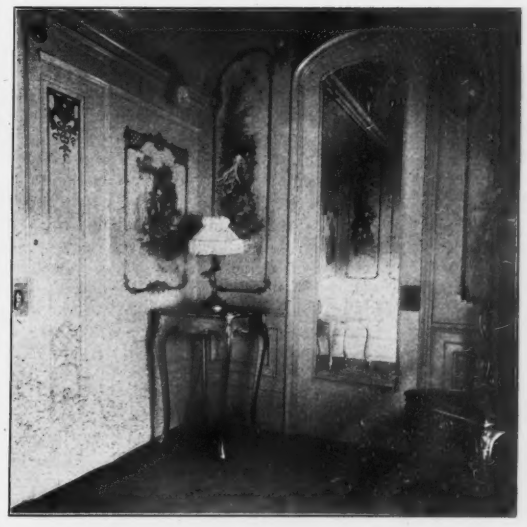


Smoking Room of the "Canada"—Canadian Pacific.



Royal Dining Room—Car "Cornwall."

Bedroom of the Duchess—Car "York."



Boudoir of the Duchess—Car "Cornwall."

Train Movements at Reading Terminal.

In our issue of Sept. 6, page 623, we gave a diagram and table showing the movements of trains to and from the busy terminal of the Philadelphia & Reading at Philadelphia for one month; and, in detail, for three hours on a busy day. In publishing this account we ought to have mentioned the very complete block signaling by which the capacity of the tracks leading to this station is utilized to the utmost. The main tracks from the terminal to Wayne Junction, 5.1 miles, are equipped with Hall automatic signals, home and distant. The block sections are very short (averaging 1,200 ft. in length and the shortest being only 400 ft. long) so that but for the stations at which passenger trains have to stop, trains could run about half a minute apart. At the busiest hours there is, for a considerable period of time, a passenger train in nearly every one of the block sections between the terminal and Wayne Junction on

both tracks. The train shed has 13 tracks. These converge into four tracks 800 ft. outside of the shed and there are two ladders or crossovers, so that two or three trains can be moved out or in at one time. During the month of July the number of movements was considerably in excess of that for the month reported (June). In July the number of trains was 15,188; made up of 13,104 regular scheduled trains, 1,417 drags to and from the cleaning yard, and 664 special excursion trains. This makes a daily average of 490, which is 57 more than the average number of scheduled trains. The record of delays in July makes a showing fully as favorable as that for June. In the record which was given (June) it will have been observed that a considerable percentage of the delays (112 minutes) was due to the necessity of slackening speed where changes were being made in the tracks. As compared with April and May this record seems to us a very creditable one. Those two months always make a good showing nearly everywhere; apparently in consequence of the combination of the most favorable weather conditions with a moderate volume of traffic; but in June, with its growing excursion and other passenger business, the percentages of punctuality at Philadelphia were not far below the average of April and May.

Delany's Rapid Telegraph.

As was noted in the *Railroad Gazette* a few weeks ago, the Pennsylvania Railroad is about to make experimental use of a new device for telegraphing at very high speed. The apparatus to be used is the invention of Mr. Patrick B. Delany, of South Orange, N. J., well-known as an electrical engineer. Mr. Delany is an old telegrapher, and his earlier inventions have been described in the *Railroad Gazette* in former years.

This latest device embodies a number of interesting and ingenious inventions. Mr. Delany is not yet ready to publish a full description of it, but from a competent telegraph man, who is thoroughly familiar with the experiments which have led up to the invention, we have the following synopsis of the principles followed in working out what promises to be a simple, cheap and quick telegraph.

"Twenty-five years ago the attention of engineers in the field of long distance signaling was suddenly diverted by the advent of the telephone, to the possibilities in the transmission of human speech. The development of telephony since its conception, marvelous as that development has been, has not increased the *rapidity* of thought transference. Two people may intelligently converse between New York and Chicago over a circuit composed of *two* large copper wires at a speed not greater than 50 words a minute. The same two wires quadruplexed may be used to transmit by hand telegraphy 100 words, and by Wheatstone perhaps 300 in the same unit of time.

"It has been known for many years that there were almost unlimited possibilities in the speed of signaling if a chemical record were used; but strong and apparently senseless prejudice has kept back its development. Mr. Delany seems to be the only one who has undertaken steadily to develop the process of receiving upon a chemically prepared paper tape rapidly recurring electrical impulses.

"If white paper be soaked in a solution of which red prussiate of potash is the active principle it will come from the solution bright yellow in color. Upon being subjected to a current of electricity from the rather blunt point of an iron needle the paper is marked a deep blue color, and if the paper be moved under the needle, the latter being subjected to a slight pressure, a heavy line will result. As at present shown at the Pan-American Exposition the mark thus made is a deep and indelible blue. If, while the treated paper is passing under the needle, the charging current be intermittently applied the record will appear as a broken line, and if these marks be so arranged as to vary in length there may be produced the dots and dashes and spaces of any telegraphic signal code.

"If another paper ribbon be perforated to correspond to the long and short marks of a telegraphic code and this ribbon be passed between two electrodes which, when united, cause a current of electricity to pass over the line and through the treated paper ribbon running under the iron needle, at the receiving end, a perfect reproduction in dots and dashes is made. The process is the simplest and most efficient form of telegraphy known. There are in circuit the power, the pens, the line. The only movement of solid matter is that of the transmitting contacts through the holes as they spring together and are again separated by the thickness of the paper tape; and the rapidity with which these movements can be made may be judged from the fact that Mr. Delany has transmitted them and made a readable code record at the rate of 8,000 words a minute, which required that there be transmitted 2,500 electrical inpulses in one second of time. This was done in the laboratory over a conductor of low resistance and capacity; but any one may visit to-day the Delany exhibit at Buffalo and see 1,000 words a minute sent over a line having a resistance of 1,200 ohms and a static capacity of 12 microfarads, the transmitting current being but 104 volts; and it is hardly possible that any competent person who will take the trouble fully to investigate the demonstration there made will deny the probability of transferring over a distance of 1,000 miles using, say, a single copper wire weighing 400 lbs. per mile, 2,000 words a minute by using 250 volts.

"But whether there be transmitted per minute 2,000 or 10,000 or 20,000 words, practically the art of telegraphy has arrived at the stage of instantaneous transmission.

"To all telegraphers who have experimented with chemical records it is known that static capacity tends to *thicken* the record, or, in other words, to obliterate the spaces, leaving a continuous blue line; and it will surprise most of them to know that Mr. Delany has demonstrated, experimentally and practically, over actual lines, before a large number of eminent electrical engineers, that without in the least changing the capacity or resistance of the line he could, by changes at the sending station, so far correct this tendency as to preserver the same total length of record, make his *spaces* indefinitely longer of to obliterate the *marks* entirely. That is to say, he has entire control over, and can quickly and easily compensate, the bad effects of static capacity.

"Another leading factor in the development of machine telegraphy is the invention of the Delany-Morse key perforator. This instrument is the evolution of the three-key and the two-key tape puncher to a one-key device which does its work better and more rapidly than either of its predecessors; and it requires no specially trained operators to work it. This perforator may be worked at any distance from the sending operator over which a line will transmit by Morse key and relay; and, consequently, is a great economizer. The tape which is its product may be made by a branch or suburban station or a way station sending to its nearest metropolitan relaying office. When received the tape may be read by the perforations and sent manually; or sent by a machine to be recorded at the distant end; either by relay or by chemical process.

"As from 80 to 90 per cent. of all the business that comes into any of the large city offices goes out again, that is to say, is relayed, it will be seen that with this apparatus the bugaboos of preparation and translation are of little consequence, for the perforations may be made as they are sent from the outside station by Morse key, and the messages being in Morse code may be translated as they are sent out by Morse from the final relaying station, the sending operator reading from the receiving tape."

As before stated, a clear description of the apparatus, with drawings, is not yet available, but its operation may be briefly described as follows:

Perforating Machines.—A paper tape ½ in. wide is continuously drawn under two punches operated by electro-magnets actuated by an ordinary Morse key. When the key is pressed down the punch near the lower edge of the tape is given a sharp blow by its magnet lever. When the key comes up the punch near the upper side of the tape is similarly actuated by its electro-magnet lever. Should both punches be operated at the same instant the holes in the tape would be in an exact vertical line; but this never happens, and the angle between the lower hole and the upper hole in the tape, owing to its continuous travel, depends upon the rate at which the tape is moving, and the rapidity with which the key is manipulated. Thus a dot would be represented by two holes thus ∘° A dash would be like this ∘ °. Therefore, letter A (a dot and dash) appears thus ∘°∘ and B (a dash and three dots) is in this form ∘ °∘∘∘. Obviously, this operation does not require either punch to remain in the tape. By an automatic arrangement of cut-off between the Morse key and the punch magnets the circuit of each magnet is no sooner made than broken again, regardless of the period for which the key is held down or allowed to remain up. The blow is delivered to the punches so quickly that the holes are made in the tape without interrupting its movement. The motor pulling the tape is adjustable to the speed of the operator's manipulation, so that the tape is made to travel twice as fast for 40 words a minute as for 20 words. Any Morse operator can work the perforating machine just as though the message was being sent over a wire.

The Transmitter.—The perforated tape is drawn through the transmitting machine by an electric motor. Two wire brushes resting on top of the tape, one in the track of each row of holes, are connected to the line. Beneath the tape are two other wire brushes, one connected to the positive pole of the transmitting current, the other to the negative pole. The ends of the upper and lower brushes are constantly pressing towards each other. When they meet in the holes a positive or negative current is sent into the line. All the lower dots go from the positive pole, the upper ones from the negative. In this way the signal impulses sent into the line are of alternate polarity, and of the same duration. The speed at which contacts may be made with this transmitter is practically unlimited, 2,500 impulses per second having been sent and recorded at the receiving station.

The Receiver.—At the receiving station the signals are recorded electrolytically on a chemically prepared tape, also drawn by an electric motor. The record is in plain dots and dashes of the Morse code. The damp tape is passed over rollers under three electrodes arranged side by side. The middle one is of iron and the two outside ones are of platinum. When a current passes in one direction from the two outside electrodes through the moist tape to the iron electrode in the middle the electrolytic action causes an iron electrode to make a blue mark. Current in the other direction leaves no record. The sending of a single character, either dot or dash, is begun by sending a current over the line in such direction that the iron electrode on the chemically treated receiving tape leaves a blue mark. As the contact through the punched hole at the sending station is broken the current is cut off, but the capacity of the line causes it to discharge through the receiving tape and continue the blue mark until the current is sent in the reverse direction by the other punch mark. The instant the current is reversed the electrolytic record of the dot or dash is stopped.

Any number of perforators that may be necessary for the traffic may be employed at the transmitting station. The wire will carry the product of 50 or more, each operator's work corresponding to the speed of a Morse circuit worked in the ordinary way. The receiving tape is automatically wound on a reel as messages are recorded. This reel, containing anywhere from one to 20 messages, is then taken to a typewritist for transcription.

The receiving machine is under control of the transmitting operator and can be started or stopped at will. All the machine tender has to do is to acknowledge the receipt of each message or batch of messages as they are rolled off. Mr. Delany says that the system will work over any kind of a line and in any weather.

Electric Switch and Signal Apparatus in Europe.

Under the title "Modern Practice in Railway Signaling," Mr. I. A. Timmis, designer of the block signaling on the Liverpool Overhead, read a paper last week before the International Engineering Congress at Glasgow, from which it appears that there is some activity and considerable interest on the other side of the water in the development of electric machines for working switches and signals. The device most prominent in Mr. Timmis' paper is an electric switch and signal machine, apparently designed by himself, in which the return current, generated after a switch has been thrown, completes the throw of the lever; and signal levers are returned to the normal position automatically. The abstract before us does not say whether or not this machine has been put in actual use; nor does it make a clear distinction between block signaling and interlocking, but the description refers to interlocking. Mr. Timmis says that the Western Railroad of France has adopted his interlocking machine, in which switches are thrown by electro magnets.

The abstract shows that the speaker, after stating that hydraulic interlocking could not compete with pneumatic and electric machines, described the Westinghouse and the low-pressure pneumatic machines and the Taylor electric machine. Continuing, he said:

In this country the first practical system fitted was on the Liverpool Overhead Railway. This is an automatic (wire circuit) block system. As a train leaves a station it puts the starting signal to danger by means of a striking bar, fitted to the rear vehicle, operating a breaking contact; and when the train is a suitable distance ahead of the signal the same bar operates a making contact which closes a circuit. This circuit is completed by the signal just passed being at "danger," and then the signals in the rear block are lowered automatically to "line clear." The train goes on to the "home signal" at the next station, and puts it to "danger." An electro magnet of the "long pull" type operates each signal with some 250 watts, and the volume of current is automatically reduced to one-tenth as the signal is lowered. The points are electrically interlocked with the signals on both lines at the cross-over roads, and in addition they are mechanically locked. After the author had fitted the signal work on the Liverpool Overhead Railway, he fitted a small but complete installation, not automatic, on the Western Railway of France, by which the signals and points are all worked by electro magnets, and the points are all locked and repeated. The Western Railway of France have adopted that system. Since then he fitted another automatic system on the small circular railroad, two miles in length, in the Paris Exhibition of 1900, practically on the same lines as that on the Liverpool Overhead Railway, but the signal arms and magnets, and resistance and contacts, are all small and light, and encased so as to avoid the action of wind and weather.

We now come to the important non-automatic installation—the "Crewe system"—at Crewe, where some 1,200 levers are being fitted, and nearly one-half are finished or well in hand. [Described in the *Railroad Gazette*, Jan. 24, 1901.] The signals are fitted in principle similarly to those on the Liverpool Overhead Railway, except that there is a counter weight. Each pair of trailing points are operated by a pair of magnets, but the facing points are operated and locked by an electric motor. The first part of the travel of the gearing unlocks by half the throw of one rod; then the other rod moves the points over by a complete throw; and then the other rod, by the completion of its throw, locks the points again, and sends a return indication circuit to the cabin, which enables the signalman to complete the movement of his lever, and at the same time the selector rod at the points determines what signals can be lowered. Unless the points are locked no signals can be lowered.

The 300-lever cabin now being fitted will have only about 150 cables of ¾-in. diam., from the cabin, each cable holding several leads. But if the low-pressure pneumatic system were to be fitted to do the same work, it would require 1,200 tubes from the cabin. This is a

condition which is of very serious moment, and is an important factor in favor of electricity.

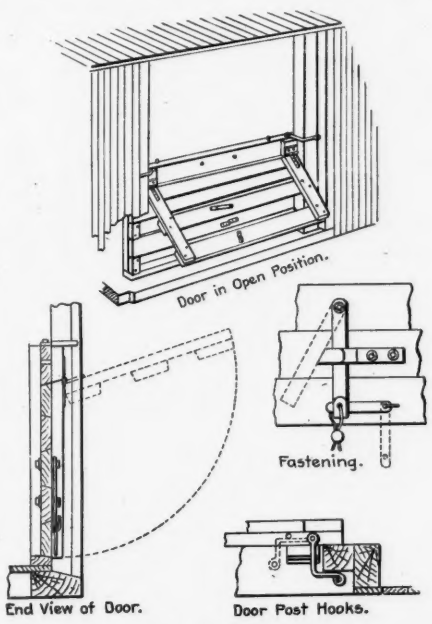
The final system to be considered is also entirely electrical, and embraces a track circuit. It is necessary to describe it, because there can be no question that in the near future all lines of railway heavily charged with passengers and goods, mixed traffic, including fast expresses, must have a track circuit fitted; and there is also no doubt that the initial difficulties which were met with in the earlier attempts have been sufficiently overcome to render it a certainty.

In this system, as in other systems, the levers in the cabin are, of course, mechanically interlocked. The signals are worked with the same magnets and gearing, only more powerful, than on the Liverpool Overhead Railway. The points are operated and locked by a pair of electro magnets with a 7-in. throw, and the final travel of the magnets is softened in its force by an air cushion. At the same time a return current is sent to the cabin lever, which completes the throw of his lever and advises him that the points are locked. When the signal is lowered the circuit is completed in the lever frame, and the lever is held in the forward position by a small electro magnet, and when the current is broken the lever goes automatically to the back position. Thus the signalman knows what is done. This arrangement enables a track circuit to be fitted economically. This circuit has a small battery in each block operating a small magnet, which, when energized, completes the main circuit.

If electric leads for such low potentials as not over 200 volts are properly fitted, it is absolutely impossible for any circuit to go wrong. There is no force of nature so constant, so easily taken from place to place, or so instant in its action.

A New Grain Door.

A paper on grain doors presented last year (see *Railroad Gazette*, Aug. 3, 1900) before the Central Association of Railroad Officers pointed out the difficulties in the way of providing a cheap grain door which will be satisfactory in all respects. It was held in that paper that permanent grain doors now in use are expensive



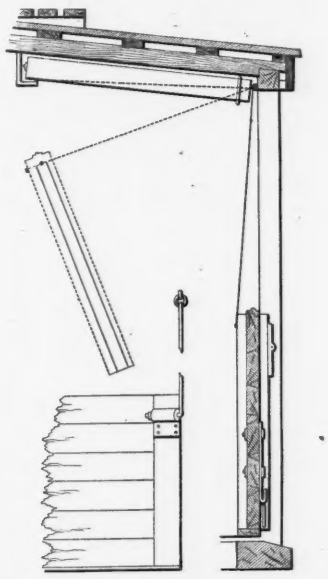
Details of the Williams Grain Door.

and that they cannot be raised with the load pressing against their sides. As a consequence of this latter objection, it is usual for elevator men to cut holes in the door to relieve the pressure or totally wreck the door. This practice makes the life of grain doors exceedingly short and also results in increasing the expense for doors. Some new designs were described intended to overcome these objections, and doubtless the paper served as an incentive for further work on grain doors. It is conceded that it is an advantage to equip cars with permanent grain doors if these objections can be overcome.

The accompanying engravings show an interesting and simple arrangement of grain door designed and patented by Mr. E. V. Williams, Railway Exchange Building, St. Louis, Mo., which promises to meet all the requirements. Mr. Williams has just put the door on the market. This door consists of two frames. The main one, resting against the ordinary car door posts, has an open space at the bottom, which is divided by a cross bar into two openings of equal size. A swinging frame, hinged to the main frame, has cross bars with beveled edges which close the openings of the main frame. The edges of the main frame bars are also beveled to permit of close joints and easy separation when required.

A catch bar of wrought iron bolted at one end to the upper cross bar of the swinging frame engages a wrought iron keeper bolted to the lower cross bar of the main frame. This bar reaches half way across the width of the lower cross bar of the swinging frame, securely holding the two frames as one door. A notched wrought iron hasp prevents the catch bar from moving from the keeper, and provides a means for sealing with an ordinary seal. Two hooks at the top of the door hold it in position against the door posts while the car is being loaded with grain. To relieve the load, the seal hasp is easily released and turned aside, the catch bar is pushed from the keeper, when immediately the swinging frame permits the grain to flow from between the bars of the main frame.

It is easier to open this door properly than to break it. The flow of grain is rapid, yet it can be checked by pressure against the swinging frame; a small opening permits the passage of some grain. When the pressure of the load is relieved through the bottom openings, the door, which is equipped with rods, is swung up to the roof of the car. The front of the door is against the roof, and the rods are at each side, so nothing is in the way of using the car for other purposes. This door is intended for old cars as well as new, as no special door posts are needed, and it is easily adjusted to any car.



Method of Hanging Door From Roof.

High Speed Electric Car of the Allgemeine Electricitats Gesellschaft.*

The car described in the paper is now finished, and, so far as trials and tests in the factory can give an indication of its behavior under working conditions, has answered all expectations. It was tested at a peripheral speed of the wheels of about 56 meters per second, corresponding to a car speed of 200 to 210 kilometers per hour.

The Studiengesellschaft was formed to study the technical and economical requirements of electric driving on long distance railroads. The maximum limit of speed for the trials determined upon was 200 km. an hour (124 miles). After careful consideration, it was decided to use an existing military line from Berlin to Zossen, placed by the German Military Department at the disposal of the Association. The paper relates to the construction and testing of the car, and to investigations and experiments in connection therewith. The running tests on the line will shortly commence.

The motors are on the car. Each car will accommodate about 50 passengers. The motors have in all a normal output of 1,000 h.p., and a maximum output of 3,000 h.p. The tests will show whether so much power is really necessary, and will indicate the consumption of power at different speeds, and under the influence of head or side winds.

For the working of long distance railroads, the three-phase alternate current system could alone be considered. The generation and transmission of three-phase currents at from 40,000 to 50,000 volts pressure present no difficulty, but on the experimental line the pressure will be only 12,000 volts, the current being supplied from the central generating station of the Berlin Electricity Works, which is situated at a distance of 12½ km. from the commencement of the line. The length of the line is 24 km.

At present, transformers are placed on the car itself to transform the current down from 12,000 to 400 volts; but it is still undecided whether, in practice, it may not be better to use motors of medium voltage, say of 3,000 volts, taking the current at this pressure from the line, to which it is supplied through transformers placed in transformer houses at definite intervals along the track. In this case the transformers would reduce the pressure from 50,000 to 3,000 volts. It is well known that static transformers require no attendance as compared with rotary transformers.

The car is provided with a driver's platform at either end, from which the control is effected. All parts carrying current are placed in a special apparatus compartment, which is separated from the rest of the car by a double sheet-iron partition. The car body is carried by two bogies, each with three axles, of which the center is only a running axle, whilst each of the others carries a 250 h.p. motor, capable of developing a maximum of 750 h.p. The diameter of the car wheels is 1.250 mm., and the speed about 960 r.p.m.

The weight of the electrical equipment was, in the first instance, not less than 50 tons for the required output of 3,000 h.p., but, by modifying the construction of the starting apparatus, motors, and transformers, the weight was reduced to 30 tons; but of this weight a large proportion was due to the transformers, which may possibly be dispensed with altogether hereafter.

The mechanical connection between the motors and the axles of the wheels was a matter of the greatest importance, the use of intermediate gearing being out of the question on account of wear and tear. Although from the first the object was to obtain an elastic coupling, various designs and devices were tried, in some of which the motor was rigidly attached to the axle, whilst in others springs were introduced. The designing of a spring attachment for use at about 1,000 r.p.m., and with an output of 750 h.p. per motor, was a difficult task. The problem was solved by connecting the motor to the wheel by an elastic coupling, and providing an elastic suspension for the motor, the springs being arranged so as to have increasing rigidity as the load increases. The motors are accordingly mounted on a hollow shaft, of which the surface speed in the bearings is nearly 15 m. per second. Experiments and observations have been made as to the friction, both at this speed and at others up to 25 and 30 m. per second, and under very great bearing pressures.

Starting resistances for motors of 250 to 750 h.p. have already been used in practice, but the problem of arranging them in a confined space, for use in continuous current regulation in connection with a current of 4 × 750 h.p., has never before been contemplated. The relative advantages of liquid and metal resistances were considered in detail. The use of the former at first seemed out of the question, whilst the latter involved the employment of a large number of contacts, brushes, connecting cables, and resistance material, making them too heavy and cumbersome.

Four motors, each with three armature circuits, give a total of 12 phases, in each of which was inserted a resistance divided into 12 steps; but in spite of this sub-division, the regulation was found to be too jerky to be satisfactory. Ultimately a liquid starting device, that could be equally well used for large winding engines, was designed. The resistance material was a solution of soda, but the apparatus had nothing in common with the ordinary liquid starting resistance.

Taking into account the fact that a speed of 200 km. per hour was contemplated, it was arranged to provide, in addition to the Westinghouse air-brake, an electrical brake, which could be used either in connection with, or independently of, the source of current. The brake was so designed that it could be applied either gently or powerfully at will.

*Abstract of a paper by O. Lasche (Berlin), read at the International Engineering Congress.

The New Delaware Breakwater.

The new harbor of refuge and breakwater in Delaware Bay is nearing completion, and was recently inspected by Gen. Gillespie, Chief of Engineers, U. S. Army. The harbor is formed by a breakwater about 1½ miles long, covering an area of 522 acres, with a minimum depth of 30 ft. at low water, and an additional area of 237 acres with a minimum low-water depth of 24 ft. A row of 10 piers above the upper end of the harbor protects it from ice coming down the bay. The work was authorized by Congress in June, 1896, and commenced by the contractors, Hughes Brothers & Banks, of Syracuse, N. Y., on May 4, 1897. The work has proceeded rapidly, and the breakwater now contains about 1,464,410 tons of stone, placed in position in about 44 working months, or at an average rate of 33,300 tons a month. The largest amount deposited in a single year was 450,440 tons, and the largest amount in a single month 63,719 tons. The work consists of a substructure of stone rising to the level of mean low water and a superstructure of very heavy stones carefully laid in position to form a compact wall 20 ft. wide at the top and 41 ft. above mean low water. The exterior slope of the superstructure is very steep and its form was adopted after a study of the old breakwater as left after long service. If the shape of the new breakwater proves successful a great saving of expense will result in building such harbors in future. The estimated cost of the new harbor was $4,665,000, but it will be completed in November at an actual cost of $2,239,334. The saving in cost is due to the low price of the work ($1.18⅜ per ton in place), and to the skilful supervision of Col. Raymond, the engineer officer in charge of the work.

Thomas Cook & Sons, who own the cable railroad to the crater of Vesuvius, are building an electric railroad from the foot of the mountain to connect with it; for the cable railroad begins pretty near the top of the mountain, 2,290 ft. from its base; and the traveler heretofore has made the ascent so far in a carriage for a distance of 11 miles over a beautiful road. The guides once burnt the engine house of the cable road, as unduly interfering with their industry. The cab drivers will be the ones to suffer now.

A New Convertible Hopper and Gondola Car.

[WITH AN INSET.]

Designers have long realized the advantages of construction that allows freight cars to be used in more than one kind of service. But experience with "combination" cars has shown that the limit to which this idea can be carried in practice is governed by the resulting complication. In this way the "combination" or universal car idea has been gradually abandoned for that of the convertible car adapted to two or three specific uses. Such a limit permits simple construction and in certain cases these convertible cars promise important economy. An excellent example of this is the convertible car recently brought out by the Rodger Ballast Car Co., Chicago, and shown in this issue. It is a car especially designed for ballasting, but it can be changed into an ordinary flat bottom gondola car capable of carrying 80,000 lbs. of coal.

There are now in use about 12,000 old-style Rodger ballast cars and this equipment is standard on practically all the larger roads, aggregating something like 100,000 miles. The objection to the old style cars is that while fulfilling all the requirements for ballasting they can be used for little else, or, in other words, they are out of service a large part of the year. In the new car, all the features of the ordinary Rodger ballast car are retained, there is the same slope at the sides, the same door mechanism and a large capacity, but beside this at the end of the ballasting season the new car can be readily changed into an ordinary flat bottom gondola and put into general service. Being able to use the new car throughout the entire year, many roads will be warranted in maintaining a full equipment of ballast cars where before it has not been feasible.

Referring to the engravings on the accompanying inset, Figs. 1, 2 and 3 show side, sectional and top views respectively of the convertible car when arranged for ballasting. Fig. 4 shows the removable center sill in position. Figs. 5, 6 and 7 are views of the car arranged as a gondola and Fig. 8 shows the end construction.

In the convertible car, the same framing is used as in the old-style car, and, in fact, everything is identical with the old Rodger ballast car up to the top of the sills. At this point the hopper ends are made removable, and the upper parts of the sides of the hoppers are replaced by foldable sections, held in place by "T" bolts through the intermediate sills, as shown in Figs. 2 and 6. These "T" bolts engage an elongated guide way in the metal frames at each side and end of each section, allowing the sections to slide into position on both the top and beveled edges of the intermediate sill. This gives a full bearing on the sill in either position and no weight is carried on hinges.

To convert the car from a hopper, as shown in Fig. 3, into a gondola, Fig. 5, it is only necessary to remove the end tie rods and four bolts which hold the sloping end in position. Then the sloping ends may be lifted and placed in a vertical position at the ends of the car, and when the bolts are tightened up and the rods replaced, the ends are perfectly secure for a gondola car. A removable center sill, with which each car is furnished and which is carried under one side of the hopper, is next placed through the center of the car, as shown in Fig. 4, resting in the recesses in the needle beams, shown in Fig. 3. Upon this sill the upper and foldable sides of the hopper are turned down and slid back toward the outside of the car, so that they rest firmly on the intermediate and center sills, as shown in Fig. 6. The car is thus converted into a standard smooth-bottom gondola car, as shown in Fig. 5. In about 45 minutes this entire operation can be performed in the field at any point along the road by three men, requiring only monkey wrenches. The same time is required to change from the gondola back to the hopper-bottom ballast car. Fig. 6 shows a section of the car transformed into a gondola car, with extra side boards added, giving a capacity of about 40 tons of coal. The extra side boards are secured to oak stakes, as shown in Fig. 5. Fig. 8 shows in detail the construction of the end and also the mechanism for operating the doors at the bottom of the hopper, which is the regular ratchet and pawl arrangement for operating the hopper doors of all standard Rodger ballast cars.

The foldable sections of the hopper in the convertible car are made of ship-lapped plank and are bound on all sides by metal frames, thus preventing the sides from swelling or warping out of shape. The shrinkage is taken care of by a ⅝-in. ship-lap, which has been in use in the hoppers of the old-style Rodger ballast cars for some ten years and is found to be sufficient under all circumstances to keep the car bottom absolutely tight. The use of inside steel stakes, as shown in Figs. 5 and 6, brings the side boards flush with the outside of the side sills, giving an additional capacity with fixed outside dimensions.

This car is simple in construction and has no machinery and, as said, there are no hinges for carrying weight. The foldable sections in both positions are so fastened that they rest directly on the top or side of the intermediate sill, having a full bearing the entire length of each section. Further, this car overcomes the only objection to the Rodger ballast cars, that they were not available for ordinary freight service. The convertible car retains all the features of these ballast cars, at the same time being readily convertible at the end of the ballasting season into a gondola car as shown, suitable for ordinary freight service.

These convertible cars have been in use during the entire season in ballasting service on the Cincinnati, Richmond & Muncie, and have given excellent service. Several other equipments are under construction. This car was designed and patented by Mr. H. S. Hart, Vice-President and General Manager of the Rodger Ballast Car Co.

Iron and Steel at the Close of the Nineteenth Century.

BY JAMES M. SWANK.

Mr. Swank contributed to the "Mineral Resources of the United States, Calendar Year 1900," an article on "Iron and Steel at the Close of the Nineteenth Century," which is now reprinted in a pamphlet of 40 octavo pages. Naturally, it is a valuable document to have in one's files. There are five pages of rapid review of the progress of the industry and then follow 16 pages of chronological record, beginning with the year 1619 and coming down to include the year 1900. This gives very briefly the leading events in the development of the iron and steel industries in the United States down to the end of the Nineteenth century, which, naturally, is a valuable collection of references and one that we should very often have liked to find at hand.

The rest of the pamphlet is made up of statistical tables with running commentary thereon. We find, for instance, statistics of iron and steel for 1899 and 1900 for the United States, for Great Britain, for the Continent of Europe and for all other countries. We find statistics of Lake Superior ore for four years and of pig iron, steel and steel rails for a like period, also statistics of recent exports and imports and of monthly prices.

The growth of the open-hearth industry is very wonderful. In 1897 the total open-hearth ingots and castings amounted to 1,609,000 long tons. In 1900 this had increased to 3,398,000 tons. In 1897 the production of Bessemer ingots in the United States was 5,475,000 tons, and in 1900 it was 6,684,000; in other words, the open-hearth steel has grown now to be just about one-half as much as the Bessemer. The following short table will show how important a part of our total rail production is over 85 lbs. a yard.

Rails Rolled in 1900 (*Long Tons*).

	Under 45 lbs.	45 lbs. and less than 85.	85 lbs. and over.	Total.
Bessemer rails....	155,950	1,625,646	602,058	2,383,654
Open-hearth rails.	886	447	.....	1,333
Iron rails	695	.....	.....	695
Total	157,531	1,626,093	602,058	2,385,682

That is, over 25 per cent. of the product was upwards of 85 lbs. per yard.

Experts' Report on Color Blind Tests.

A committee of the American Ophthalmological Society presented at the recent annual meeting of that Society a report on standards and methods of examining the acuteness of vision, color sense and hearing, which is probably the most comprehensive monograph on the subject which has ever been made; at the same time its conclusions are brief and well written, summarizing the salient features of this subject in an admirable manner. The committee consisted of Drs. Charles H. Williams, William Thomson and William S. Dennett. Dr. Williams and Dr. Thomson are well known to the readers of the *Railroad Gazette* as the vision experts of the New York, New Haven & Hartford and the Pennsylvania railroads, respectively. The committee was appointed two years ago and its report, which fills 45 pages, contains the gist of what has been done by former committees. This matter, going to make up a review of the subject under discussion for the last 20 years, embraces notices of the work done by the International Medical Congress at London, 1881; the Royal Society, England, 1892; the regulations in use on the Pennsylvania Railroad (originally adopted in 1881); the regulations of the New York, New Haven & Hartford (adopted 1899, revised July, 1901); report to the American Medical Association, St. Paul, June, 1901; the most approved rules for using the Holmgren test and descriptions, with cuts, of Dr. Williams' and Dr. Thomson's lanterns.

The conclusions of the committee are as follows:

Conclusions and Recommendations.

Your committee feel that no attempt should be made to compel the adoption of any standards or methods of examination by means of legislation; they believe the best results will be obtained by showing the operating officers of our railroads how their service can be improved, by adopting methods of examination which will be reliable, and by maintaining standards which will be high, but not impracticable, for those entering the service, and will be the minimum of safety for old employees on re-examination.

Railroad officials are justly sceptical as to the value of certificates issued by physicians not connected with the road, especially when their fee is paid by the man who employs them and not by the company. Experience has shown that excellent results can be obtained by having the examinations for vision, color-sense and hearing made by employees who have been carefully instructed by a trained ophthalmic surgeon in the methods to be followed, and who have been supplied by the railroad company with a complete and uniform outfit for making these tests. With a record of each examination filed at the central office, and especially when all the work is done under the supervision of an expert ophthalmic surgeon, and in accordance with instructions formulated by him, the results are likely to be much more satisfactory than when the work is left to physicians, or others, without fixed standards or methods, and with only such an outfit for making the tests as they may happen to have.

Your committee recommend: 1. That all railroad employees concerned with the movement of trains or reading of signals be carefully examined as to their acuteness of vision, color-perception and hearing.

2. That a trained ophthalmic surgeon be selected by each company, who shall instruct and examine the men selected by the company to make these tests, shall recommend the standards and methods to be used, shall see that the equipment furnished to each examiner is sufficient, that it is kept in proper order and renewed when necessary, and who shall be the authority to whom the doubtful cases shall be referred for final settlement.

3. That the acuteness of vision shall be tested by the test types of Prof. Snellen, or those which conform to his standards.

4. That the following minimum requirements be adopted for acuteness of vision:

Class A.

Entrance to Service or promotion.	Re-examination of those in the service.
20/20 in each eye tested separately, without glasses.	20/30 with both eyes open without glasses. Each eye should also be tested separately and the vision of each noted.

Class B.

20/20 in one eye and not less than 20/40 in the other. Tested separately without glasses.	20/40 with both eyes open without glasses. Each eye should also be tested separately and the vision of each noted.

Class C.

20/20 in one eye and not less than 20/40 in the other. Tested separately with or without glasses.	20/40 with both eyes open with or without glasses. Each eye should also be tested separately and the vision of each noted.

Class D.

20/40 with both eyes open, with or without glasses.	20/50 with both eyes open, with or without glasses.

Class A is to include enginemen and firemen in road service. Class B is to include other employees in the engine, train or yard service, and car and engine inspectors. Class C is to include towermen, telegraph operators, station agents and section foremen. Class D includes crossing flagmen.

5. That the color-perception be tested by means of the colored worsteds of Prof. Holmgren, preferably with worsteds tagged for purposes of record; also, that in every case an additional test be made with a lantern showing a number of colored lights, which can be varied in their size and intensity.

6. That no one shall be considered to have satisfactory color-perception who calls a red light green, a green light red, a red light white, under any of the varying conditions of the lantern test; or who selects with the green and also with the rose test skeins the characteristic confusion colors.

7. That the hearing be tested by the spoken word of the examiner and by a watch or acoumeter, and that for entrance to the service a candidate be required to repeat correctly words or numbers spoken in an ordinary conversational tone at a distance of 20 ft.; or, for re-examination, at a distance of 10 ft.

8. That re-examinations be made at intervals of three years, also before promotion, and oftener in special cases, where necessary.

Southern Railroad Commissioners' Convention.

The Southern Railroad Commissioners' Association held its annual convention at Asheville, N. C., Sept. 10 and 11. Commissioners were present from Arkansas, Florida, Kentucky, Louisiana, Mississippi, South Carolina, Texas and Tennessee. A letter of regret was read from Chairman Knapp, of the Interstate Commerce Commission, who was unable to be present. The President of the Associatoin elected for the ensuing year is C. C. McChord, of Kentucky, and the Secretary is J. A. Webb, of Mississippi (Jackson).

Informal discussions were had of the question of the prompt collection from railroads of bills for overcharges on freight, and of various other topics. The principal formal business was the consideration of a report on Legislation made by a committee, of which Mr. Reagan, of Texas, was Chairman. Mr. Williams, of Tennessee, read the report. As a result of the consideration of this subject the Association adopted eight resolutions, which in substance were as follows: (1) That Congress be requested to empower the Interstate Commerce Commission to prescribe reasonable rates; (2) also to prescribe a national freight classification; (3) that the Legislatures of the several states be requested to require new railroads to report cost of construction; (4) also to require all railroads to keep more complete and detailed accounts, separating the figures for intrastate from those

covering interstate business; (5) also to authorize their respective railroad commissions to employ expert accountants; (6) that the several state railroad commissions be urged to adopt the national freight classification as soon as it comes out; (7) that Congress be requested to require Federal courts to give preference to railroad cases where the state commission is interested or the public interests involved; (8) that Congress be requested to change the law concerning the issuance of injunctions by Federal courts; so that when a railroad enjoins the enforcement of rates by a commission it must give bonds to refund overcharges if the final decision is in favor of the commission.

The next meeting of the Association will be held at Hot Springs, Ark., on Oct. 14, 1902.

The Red River Bridge at Alexandria, La.

Work was begun a little time ago on a single track bridge across the Red River at Alexandria, La., for the Shreveport & Red River Valley Ry. The total length of bridge proper is to be 941 ft. and the length of the trestle approach is 4,800 ft. Exclusive of approaches the bridge is to consist of three fixed spans, each 210 ft. in length, and a draw span 300 ft. in length.

The piers are to be entirely of concrete. The four river piers are to be founded on wooden pneumatic caissons sunk through about 55 ft. of fine sand and blue clay to a soapstone substratum. This rock foundation is 55.6 ft. below extreme low water; 97.5 ft. below extreme high water and 111 ft. below the base of rail. The octagonal caisson for the pivot pier is 13 ft. 6 in. in height, 30 ft. from outside to outside, and is surmounted by a wooden cofferdam which extends up to a point just below the mud line of the river bed, making the total height of caisson and cofferdam 53 ft. 6 in. Each of the other three caissons is rectangular, 16 ft. x 34 ft., and it and its cofferdam have the same vertical dimensions as the caisson for the pivot pier. The two end or shore piers are to be founded on piles driven inside of an open excavation made by means of a cofferdam. The piles are to be driven to the rock and cut off below low water, and the concrete is to be filled in around them down to a point 8 ft. below their tops.

All the caissons and cofferdams, including those of the shore piers, are to be filled with concrete made up of 1 part of Portland cement, 3 parts of sand, and 5 parts of broken stone (to pass a 2½ in. ring). The piers above the cofferdams, including the copings, are to be made of concrete of the same composition as that of the foundation concrete, except for the exterior 1½ in. of exposed portions and for the top 12 in. of coping. For the exterior 1½ in. and for the tops of copings there is to be used a mortar of 1 part of Portland cement and 2 parts of sand. The method of placing the exterior 1½ in. coating is to be as follows: Steel plates are to be blocked out from the form, while each layer of concrete is being tamped into place; then immediately after the concrete has taken its initial set, or has become solid enough to stand up, the plates are to be removed and the spaces left are to be filled with Portland cement mortar as above. The inside surface of forms for all exposed surfaces is to be coated with gloss oil, and then thoroughly sanded so as to break up the grain of the wood and give a uniform surface. The piers from cofferdams up are to have a batter of ½ in. to 1 ft. and under coping are to have the following dimensions: Pivot pier (circular) 22 ft. diam.; three other river piers (with rounded ends), 7 ft. 6 in. x 26 ft. 6 in.; shore piers (rectangular with rounded corners), 23 ft. x 6 ft.

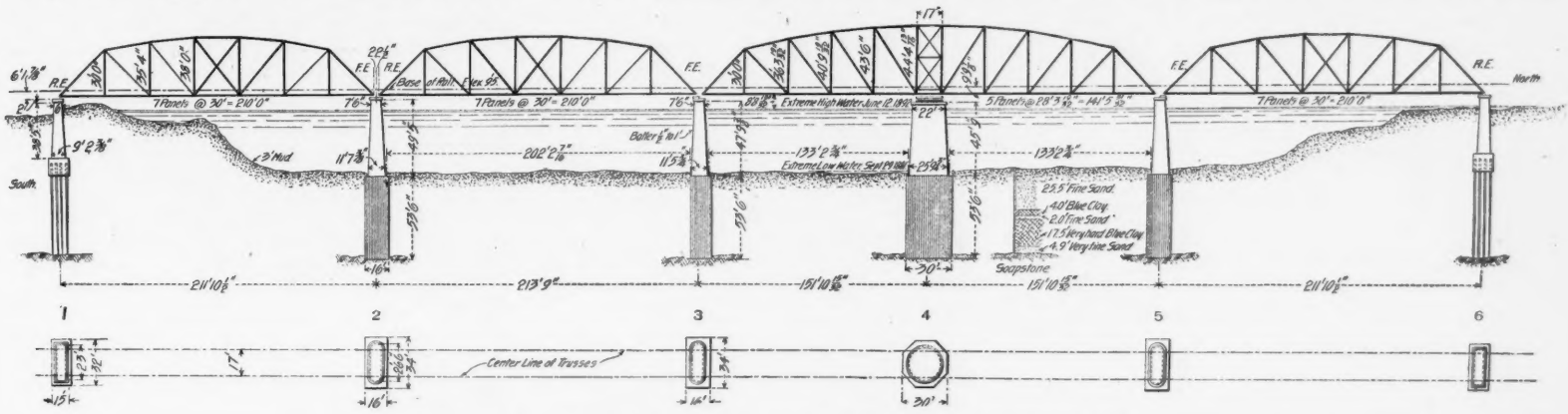


Fig. 1—General Plan and Elevation of the Red River Bridge at Alexandria, La.

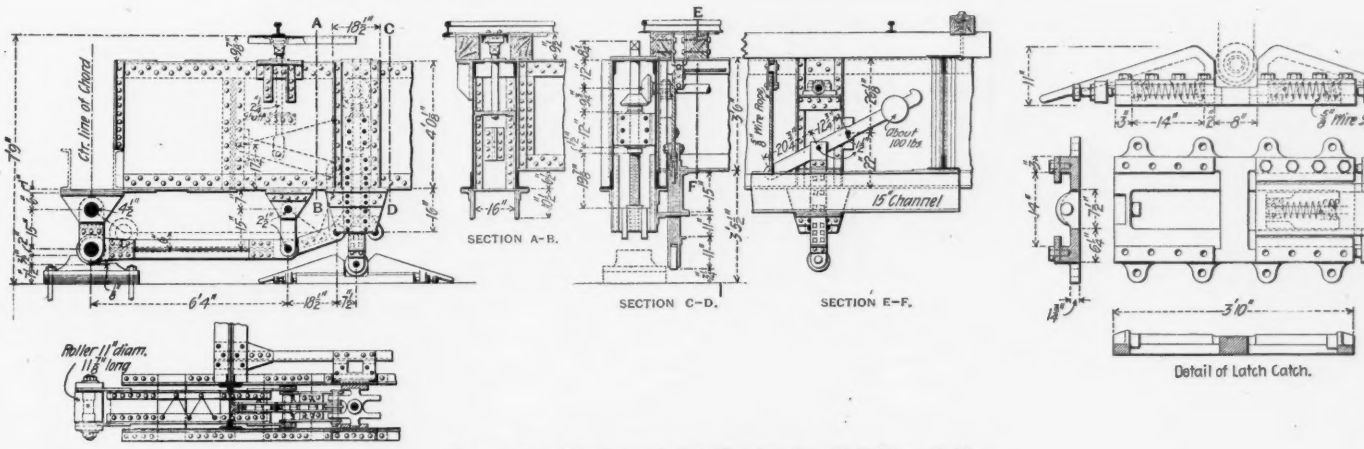


Fig. 3.—End Lifting and Latching Device—Red River Bridge.

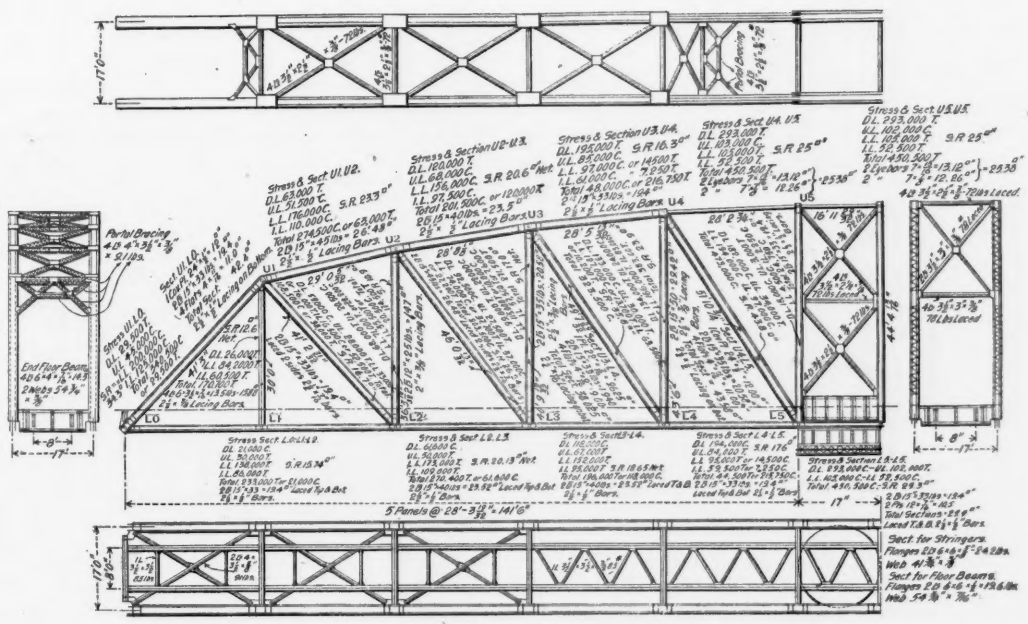


Fig. 2.—Stresses and Sections—Draw Span, Red River Bridge.

GENERAL DATA.

Length of span c. to. c. of end pins			300 ft.
Distance c. to c. of trusses			17 ft.
Clearance above base of rail			22 ft.
Dead load for floor system	800	lbs. per lin. ft.	of span
Dead load for trusses	2,500	lbs. " "	"
Live load for stringers	7,400	lbs. " "	"
Live load for floor beams	5,950	lbs. " "	"
Live load for trusses, one arm loaded	5,140	lbs. " "	"
Live load for trusses, both arms loaded	9,700	lbs. " "	"

Uplift at end of one truss....32,000 lbs. assumed.
Wind load upper lat. system. 210 lbs. per lin. ft. of span
Wind load lower lat. system.. 510 lbs. " " "
Ties 8 in. x 10 in. x 11 ft. 0 in., dapped ½ in. on stringers.

Impact $= \frac{400}{L + 500}$ where L = length of span loaded.

When member receives its maximum stress.

Drop at ends due to dead load deflection	2 3/32 ins.
Drop at ends due to camber	1 29/32 "
Total drop at ends due to camber and deflection	4 11/32 "
Rise at ends due to uplift of 32,000 lbs. at each end of each truss	3/4 "
Total drop to be taken up in top Chord, eyebars	3 17/32 "

The superstructure is to consist of pin-connected, through, Pratt truss spans of the lengths mentioned above. The upper chords of the trusses are practically curved from the inclined end posts out to the center of the trusses, there being a slight change in direction at each panel point. The depth of trusses of the draw span is 30 ft. at the first panel point, and 44 ft. 5 in. at the center. The depth of trusses of the fixed spans is 30 ft. at the first panel point, and 38 ft. at the center. The trusses are 17 ft. c to c. The stress diagram of a truss for the draw span is shown in Fig. 2. The bridge is designed for a live load in accordance with class U. loading, Waddell's "De Pontibus." All metal for the trusses is to be of medium steel, and all rivets of soft steel. In the detail structural work there is no wide divergence from accepted practice.

A rail and end-lifting device for each end of the draw span is operated by a 2½-in. shaft, leading from the machinery at the center of the span. The latching device is controlled by a ⅝-in. wire rope, also operated from the center of the span. Fig. 3 shows the essential details of these devices at the end of the span. The latch catch is that known as the Pencoyd design. The expansion joint for rails at joints next to draw span is an interesting detail. The draw will be turned by an 11 h.p. engine, which will operate the span under an unbalanced wind load of 5 lbs. per sq. ft. on one arm in about 3½ minutes.

This bridge, which may later be adapted to highway traffic, also, by slight changes in the floor, is, as stated, being built for the Shreveport & Red River Valley Ry., of which J. M. Phillips is Chief Engineer. Waddell & Hedrick, of Kansas City, are the designing engineers, and will superintend the construction.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Gross earnings for August have been compiled by the *Chronicle* for 102 roads with about 105,000 miles. The earnings amount to $67,777,000, the increase over the previous year having been $7,621,000, or 12.7 per cent. The year before the gain was 6.14 per cent. and in 1899 it was 13.48 per cent. Most of the roads especially affected by the Pan-American travel do not appear in this compilation of earnings.

Railroad Commissioners from eight Southern States attended a convention at Asheville, N. C., last week, and we give in another column a short report of their doings, as published in the *Charlotte Observer;* but we are bound to say that the convention appears to have been entirely barren of useful results. There is a National Convention of railroad commissioners which meets every year, and which comes pretty near being useless; but this Southern gathering surpasses it in inutility. It appears that two prominent Southern commissions, those of Alabama and Georgia, were absent. The eight resolutions passed, which appear to summarize the work of the meeting, are all useless, and nearly all are worse than that; if they have any influence on anybody the influence will be harmful. The publication of such a series of opinions, coming from public officers, as the only result of a formal consultation, carries the implication that the subjects dealt with are the only ones which deserve consideration. This is not true; and it is, therefore, misleading to make prominent these impractical questions. On the first question, that of having a National rate-making authority, it is perhaps natural that the commissioners should deem it proper to express their wishes. As there is perhaps some public sentiment in favor of their proposition, they will think it presumption on our part to call the resolution useless. But we may at least suggest that such a resolution, to do any good, would have to be fortified by a very powerful argument; what does a ten-line resolution amount to? Congress has not cared enough about the subject to seriously discuss it for several years past. Uniform classification appears to have been given up, even by its best friends; those of them who see the true bearings of the proposition. This makes the second and sixth resolutions more useless even than the first. What would a statement of cost of construction amount to? What good has come from the statements of cost that the Texas railroad commission has made? A new railroad could without doubt practically falsify its statement, without telling any lies; and the most exact statement imaginable would, generally speaking, afford no practical assistance in getting at the true basis of taxation. The demand for accountants looks childish. When a legislature really wants information from railroad books, the question of the salaries of the accountants will not be any hindrance. This remark applies to the two other resolutions; legislatures need to be argued with, not about the details of carrying out their wishes, but, if at all, about the propriety of the wishes themselves. We trust that the informal, unreported conversations which these Commissioners held with one another were more profitable than those whose results appear in the record.

Cast Steel Locomotive Frames.

In our issue of June 14 we stated some of the advantages of cast steel locomotive frames and considered some objections that have been offered to this use of cast steel. The information given seemed to leave little if any doubt of the reliability of cast steel as it is now made for this purpose, and the question of comparative cost was merely touched upon and left for later consideration. We now have further information on this and some other points, including the extent to which cast steel has entered into frame making in the last few months. Thus far we have heard no opinion against the favorable views before expressed. These and other reasons must lead one to suppose that the movement toward a more general use of cast steel frames has been stimulated by the facts that have been published.

In regard to comparative cost of wrought iron and cast steel frames the situation may be stated thus: In big locomotive building establishments having large forge-shops provided with furnaces, hammers and the necessary working force that goes to make up this costly but important wing of the plant, frames of comparatively small locomotives, many of which are extremely simple in design, can be forged in iron cheaper than they can be cast in steel. The reason for this is not obscure. The welds are light and easily made and there are not so many of them in some cases. The hammer-shop force is kept at work, often doing this frame work in intervals which otherwise would involve partial inactivity of the forge plant. It is, therefore, considered good practice to forge the frames of the lighter classes and, when conditions permit, to forge enough of the heavier frames to fully engage the forge-shop facilities. It is noted that practically all locomotives exported by locomotive builders in the United States have wrought iron frames. These locomotives generally come within the limits of what are now considered light-weight locomotives and their frame work is correspondingly simple.

When heavy frames are to be made, involving greater difficulties of design and considerable areas in cross section, cast steel offers relief from some of the most difficult and expensive operations. The heavier frames can be made not only better but cheaper in cast steel; how much cheaper, pound for pound, cannot be stated in a way to cover individual designs because each design has its own difficulties. It may be said, however, that on the heavy locomotives now commonly used, the reduction in cost is well worth securing, in addition to the assurance that the frames will have no heavy welds with the possibilities of hidden flaws which every blacksmith dreads.

In trying to decide at what point to discard the forged iron frame and use cast steel to best advantage the Baldwin Locomotive Works have fixed the line tentatively at locomotives having cylinders 20 in. in diameter or larger. This is not an arbitrary rule with them, but to show to what extent it has been followed in this year's work the following figures are given: From Jan. 1 to Aug. 31, 874 locomotives were built and 550 of them had cylinders 20 in. in diameter or over. These figures in themselves are interesting, as showing that the production has been at the rate of 109.25 locomotives a month, or 4.2 locomotives a day, assuming 26 working days per month since Jan. 1. Of the 550 locomotives, 336 have cast steel frames, thus showing that over 61 per cent. of the locomotives which for the present purpose are classed as "heavy" have cast steel frames.

This is a very substantial showing for cast steel and the distribution of these locomotives among the several railroads is interesting to note. Of the 336 locomotives 64 were for the Baltimore & Ohio, 64 for the Pennsylvania system, 66 for the Union Pacific, 50 for the Philadelphia & Reading, 15 for the Chicago, Burlington & Quincy, 40 for the Lehigh Valley, 5 for the Rio Grande Western and 32 for the Erie. Considering this information with the almost unqualified endorsement of cast steel frames as summed up in our issue of June 14, there is apparently little further argument necessary to firmly establish the strong claims of cast steel for general recognition in this capacity. The most reliable information that we have been able to obtain fixes the loss from defective castings in cast steel frames at a small fraction of one per cent. on account of actual rejection in the shop. The general feeling now seems to be that cast steel fit for this work can be had in this country reasonably straight from the molds, reasonably close to the finished dimensions, and reasonably free from shrinkage strains, honeycomb and imbedded dross. There remain then only the questions of expediency and of cost in making frames from designs more or less complex and requiring greater or less cross sectional area and weight. Not the least of the value of cast steel lies perhaps in the readiness with which it may be adapted to variations of design.

The Legal Regulation of Engineering Practice.

In one form or another the proposition to regulate the practice of engineering comes forward at more or less frequent intervals. Sometimes a code of ethics, to be adopted by the societies, is proposed; sometimes legislation is suggested. At the last convention of the American Society of Civil Engineers the matter came before the Society in the shape of a proposition to protect the profession and the public from engineering quacks and incompetents by state laws. The argument for was admirably presented by Mr. Whinery, as may be read on another page of this issue. He has analyzed his topic and stated it so thoroughly and systematically that he leaves nothing more to be said on the affirmative.

But we have long believed that the whole argument for trying to protect people from the dangers of incompetent engineering, and for trying to protect the profession from quacks and other objectionable characters, by laws or codes, rests on a set of mistaken assumptions.

Mr. Whinery says: "Any man who chooses may assume to practice civil engineering. . . . That this condition of affairs is anomalous need not be argued. Neither in any other profession nor even in the well-established trades are similar conditions tolerated. . . . In this country, the great profession of engineering, in its several branches, is almost alone in being open to the pretender and the quack. . . . At present the public has no ready means of determining whether a man who poses as a civil engineer is competent or incompetent, and in the absence of such knowledge, it is often imposed upon by the charlatan."

Here we have the fundamental assumptions that lie beneath all efforts for legal regulation of the profession, or to regulate it by codes of ethics voluntarily subscribed to—the assumption that other professions are better regulated by laws than the engineering profession; that consequently the members of those professions and the public are, by such regulation, better protected from incompetent or unprincipled practitioners; that if like regulations were thrown around the engineering profession like protection would be had. What are the facts?

Every intelligent citizen of much experience can remember examples, more or less numerous and important, of ignorant, incompetent or roguish lawyers and doctors in prosperous practice and in respectable standing. The writer of these lines recalls at once two recent instances within his own knowledge of people killed. In one case the physician was grossly ignorant of anatomy or his courage failed and his wits forsook him in the critical moment; probably all of these conditions conspired. A post mortem was held and the facts became known to three or four other physicians. The case was one of flagrant incompetency; yet that man is protected by the ethics of his profession and goes on in respectable practice. In another case, the patient, suffering from extensive peritonitis, was put in a carriage and driven six miles to a hospital and of course died. There was no reason for this but the convenience of a household which did not wish to be bothered with the presence of the patient. The physician who permitted this is in respectable standing and prosperous practice in the same neighborhood in which he abetted this manslaughter. In two cases well known to the writer, lives were saved in spite of the family physician and against his opinion and advice. These cases are cited because they happen to be known to one layman, of no very unusual experience, and because there can be no doubt of the facts.

But these are examples of what goes on in the legitimate profession; beyond this is the pestiferous horde of cancer-doctors and bone-setters and osteopaths and Christian Scientists against whom laws cannot protect either society or the reputable physicians.

Similar conditions prevail in the law. We shall

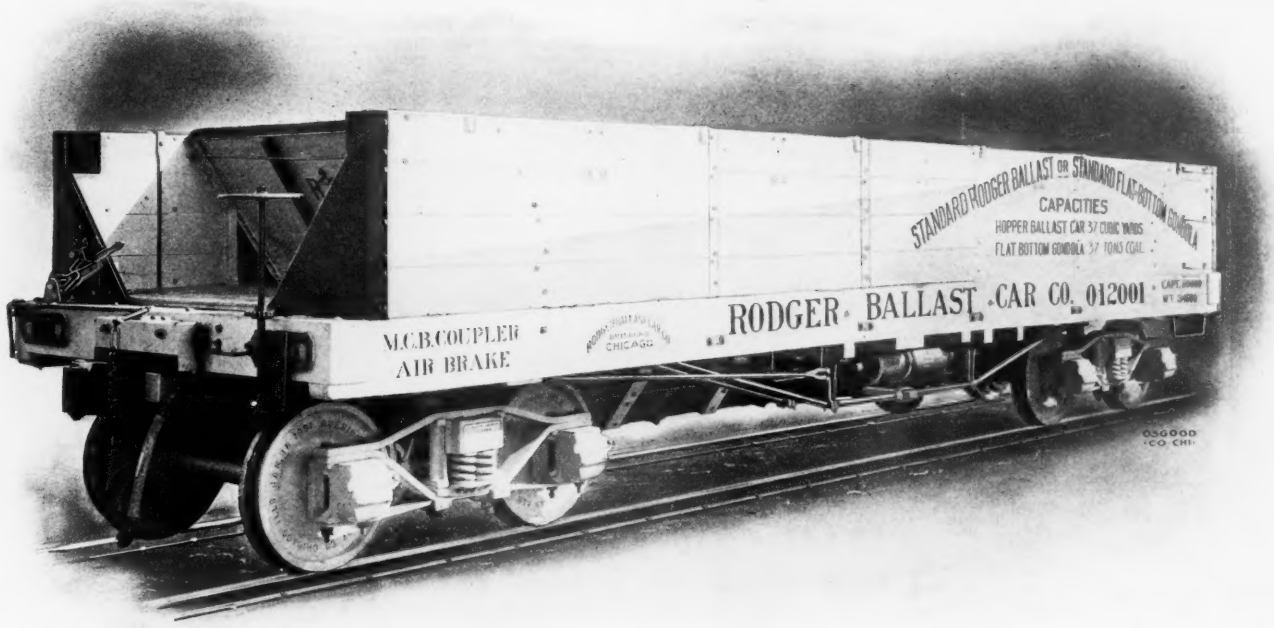


Fig. 1.—Car Arranged for Ballasting—Removable End Sloping.

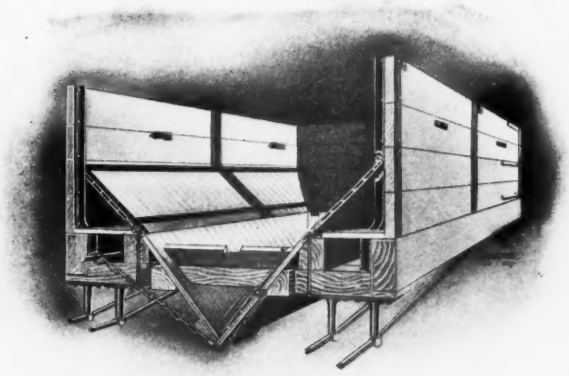


Fig. 2.—Section Just Ahead of Needle Beam—Car Arranged for Ballasting.

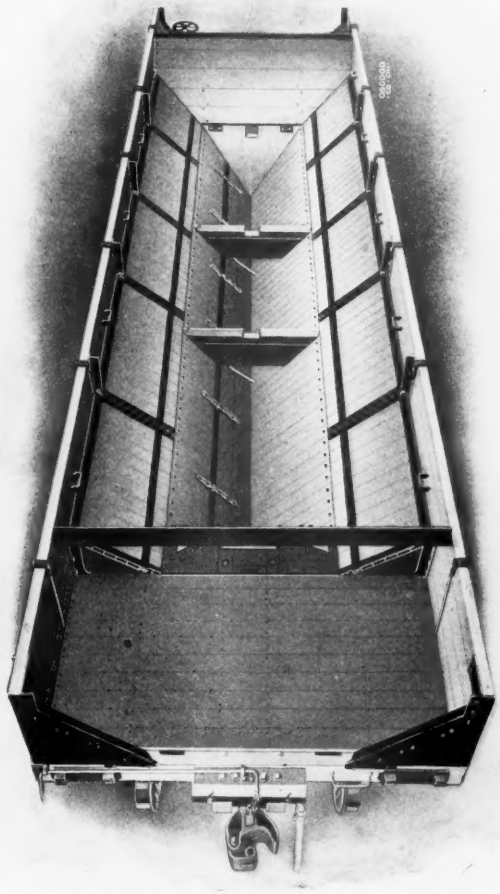


Fig. 3.—Top View—Car Arranged for Ballasting.

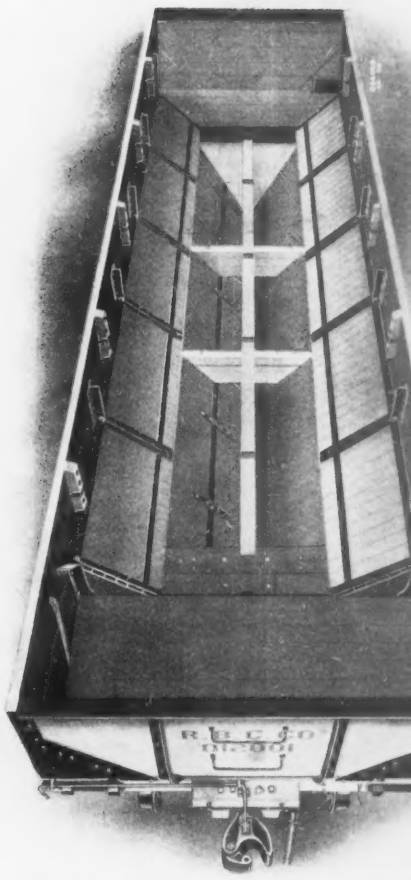


Fig. 4.—Top View—Removable Center Sill

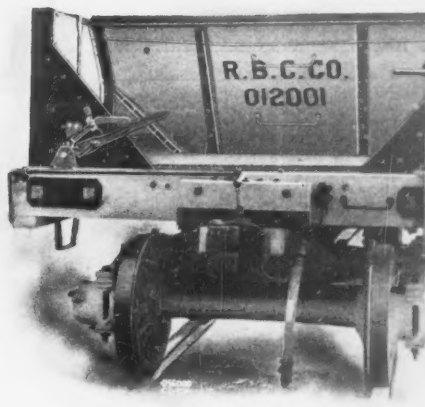
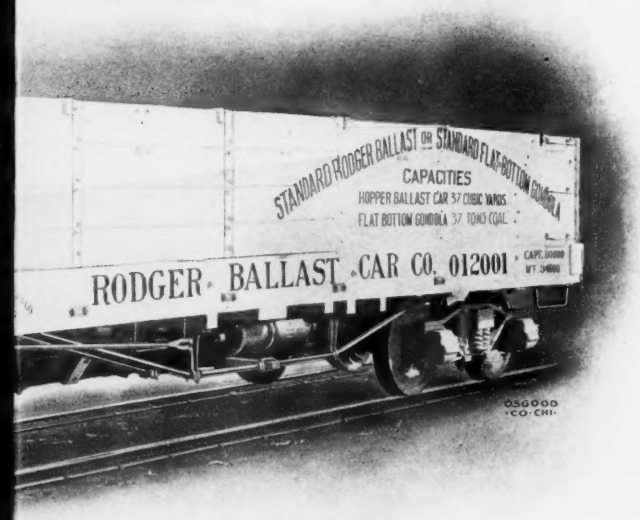


Fig. 8.—End View—Details of Construct



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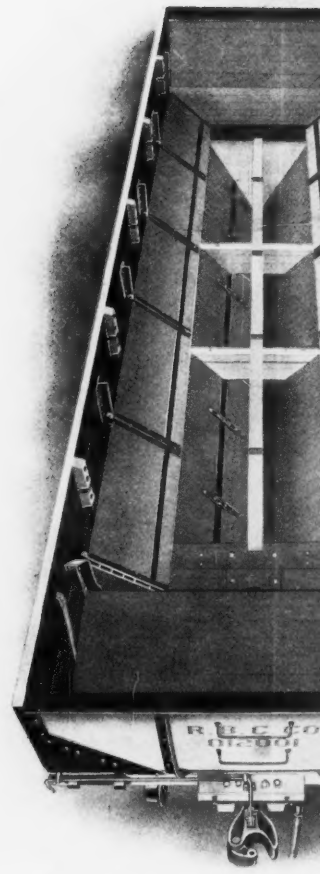


Fig. 4.—Top View—Removable C

Fig. 8.—End View—Details of

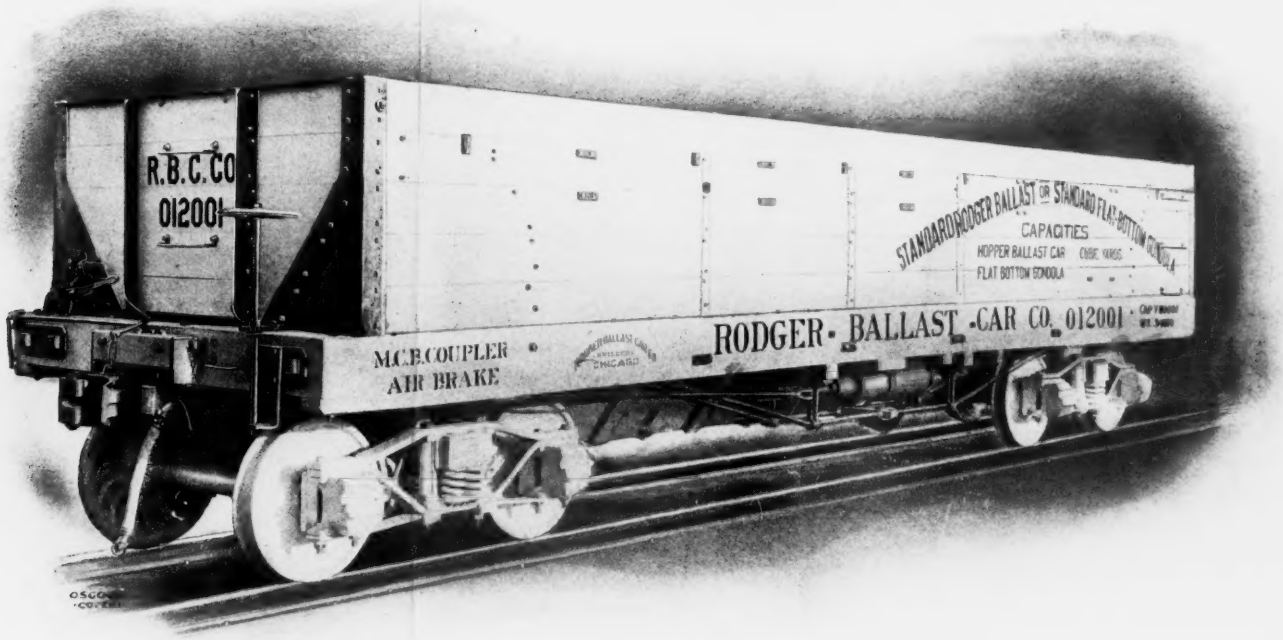
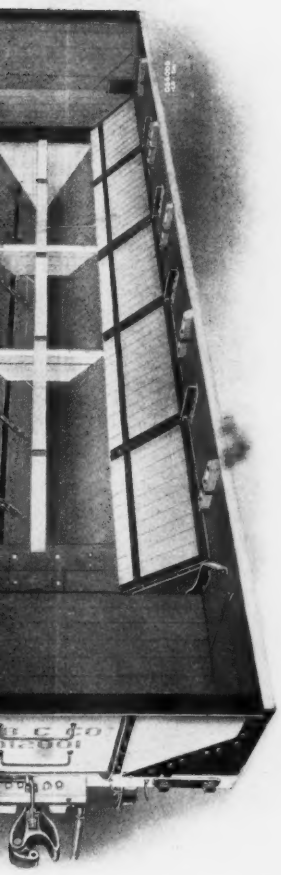
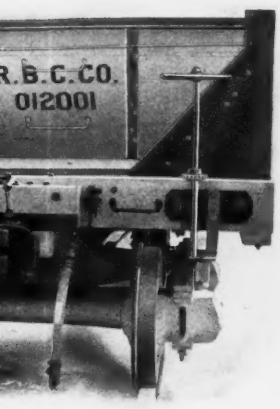


Fig. 7.—Car Arranged as a Gondola—Removable End Vertical.



Removable Center Sill in Position.



—Details of Construction.

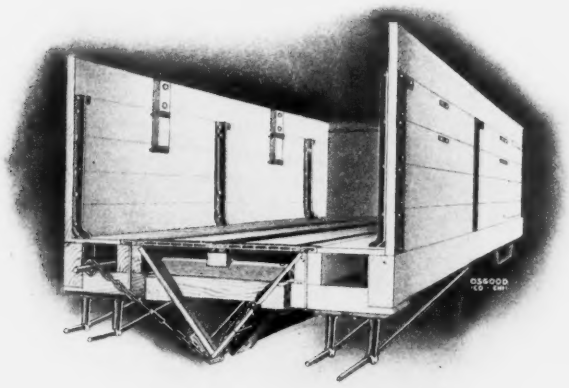


Fig. 6.—Section of Car Arranged as a Gondola.

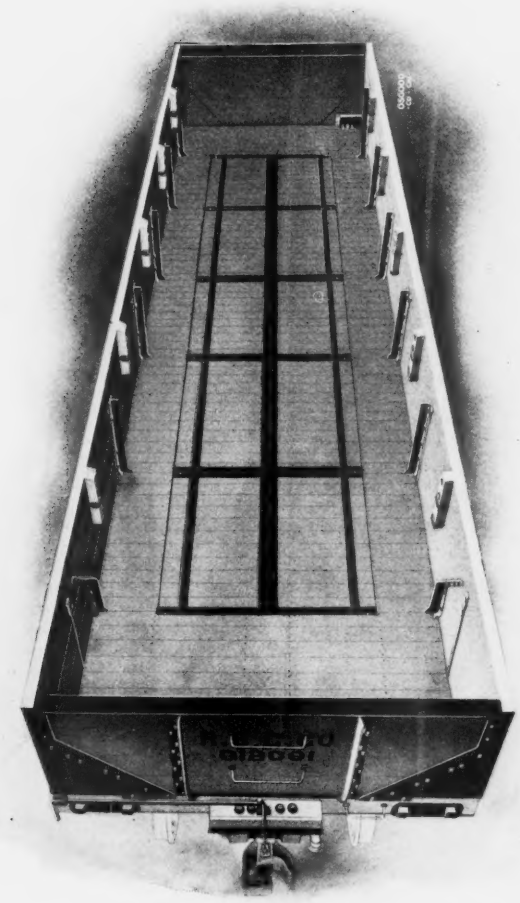


Fig. 5.—Top View—Car Arranged as a Gondola.

CAR—RODGER BALLAST CAR COMPANY, CHICAGO, ILL.

not talk now of the respectable sophistries and perverted ethics of the profession. "We will not at present inquire whether it be right that a man should with a wig on his head and a band around his neck do for a guinea what without those appendages he would think it wicked and infamous to do for an empire; whether it be right that, knowing a statement to be true, he should do all that can be done by sophistry, by rhetoric, by solemn asseveration, by terrifying one honest witness, by perplexing another, to cause a jury to think that statement false." All of that is matter of ancient debate and need not be considered now. But quite apart from that is the vast tribe of semi-criminal lawyers who infest civilized society. Every intelligent man recognizes the curse of the "ambulance bar;" every reputable lawyer deplores the degradation of the profession by the practice now so common of taking cases on speculation.

We need follow these disagreeable inquiries no further; enough has been said to remind the reader that the engineering profession is far from being "alone in being open to the pretender and the quack." In fact a very good argument might be made on the proposition that engineering is more free from pretenders and quacks than any other great profession, and that this is inherent in the very nature of the profession and of its present relation toward the external universe.

Annual Reports.

Chicago, Milwaukee & St. Paul.—The fiscal year of this company to June 30 shows further increases in traffic, gross earnings, and profits, and further reduction of cost of transportation. The year opened with a prospect before the company of a heavily decreased wheat tonnage through the failure of the spring wheat harvest in Minnesota and the two Dakotas in the summer of 1900. The wheat crop of these two states yielded but 89 million bushels last year as against 158 million bushels in the previous year, a loss of 46 per cent. The crop of oats in the same states also fell off heavily, or from 86 million bushels to 61 million bushels, 30 per cent.

The St. Paul territory was not as seriously affected by this loss as that of other lines, but with 2,560 miles (of its total of 6,596 miles) in the three states named, its tonnage was bound to be adversely affected. Tonnage of wheat, however, fell off but 44,320 tons, or 3 per cent. The loss in oats was heavier, 84,000 tons or 16 per cent., and the decrease in other agricultural products made a total loss of 188,000 tons in this class of traffic. Diminished movement in other traffic brought a total falling off in tonnage of 478,000 tons.

This was more than counterbalanced by increases in other items, and the year's report shows a net increase of 253,300 tons, or 1.43 per cent. in tons carried, which were 18,010.700. The gain was largely in coal, 263,000 tons; in building material, in flour, and in live stock and dressed meat, in which the gain was 100,000 tons. The small loss in wheat tonnage, in spite of the spring wheat harvest failure, is due to the fact that the company carried a very heavy amount of winter wheat from Kansas, where the yield last year was large, to the Minneapolis mills. This traffic, as well as the other classes accounting for the increase in the year's tonnage movement was taken at low rates so that the average ton-mile revenue decreased from 9.3 mills to 8.61 mills. A lower average has been reported in this item for each successive year since 1897. The St. Paul is the first important company of those which have submitted reports the last fiscal year to show a lower average ton-mile rate for the period.

The gain in ton-mileage was 282½ millions, or 8.4 per cent., as against a gain of 9⅓ per cent. in the 1900 tonnage movement. Lower rates, however, explain the moderate increase in freight revenue, $138,000. Even this increase and the aggregate increase in gross earnings, $484,000, is accounted for by increased mileage, 165 miles having been added to the average length of operated road in the year. Operating expenses were considerably reduced, however, particularly in the first half of the fiscal year, and for the 12 minths the decrease is $443,333. Comparison of the income accounts of the last three years follows:

	1901.	1900.	1899.
Mileage	6,512	6,347	6,153
Freight earnings	$31,357,992	$31,220,217	$28,773,222
Passenger earnings	7,939,215	7,698,513	6,778,921
Mail, exp., etc.	3,071,804	2,965,961	2,758,488
Gross earnings	$42,369,012	$41,884,692	$38,310,632
Operating expenses	27,977,503	28,420,837	23,962,836
Net earnings	$14,391,509	$13,463,854	$14,347,795
P. C. exp. to gross	66	67¾	62½
Net revenue	$14,566,192	$13,608,611	$14,465,205
Interest	6,383,035	6,633,170	6,890,120
Balance for divid'ds	$8,183,157	$6,975,441	$7,575,085
Pref. stock div. paid	2,851,059	2,516,528	2,278,931
Com. stock div. paid	2,593,123	2,351,530	2,318,980
Surplus	$3,738,975	$4,597,911	$4,635,708

Gross earnings, net earnings, less taxes, and surplus available for dividends of the St. Paul for a series of years follow:

	Gross.	Net.	Surplus.
1898	$34,189,664	$11,853,966	$5,928,702
1897	30,486,768	10,724,998	4,583,304
1896	32,681,829	11,922,037	5,400,390
1895	27,335,369	9,206,916	2,796,886
1894	31,327,951	10,014,542	2,510,794
1893	33,975,055	10,550,767	3,485,551
1892	32,283,508	10,772,710	3,610,974

The saving in operating expenses was entirely in maintenance account and in the special funds which have been set up in St. Paul accounts for the half dozen years past, to provide for heavy improvements of an extraordinary character and for additional equipment. These funds have been built up through appropriations out of the heavily increased revenues of the company. Last year the appropriations to the renewal and improvement account and for additional equipment were $729,050 less than in 1900, but still amounted to $2,296,000. These charges, it should be noted, are entirely apart from maintenance cost, and are of the nature of the appropriations which most companies carry in their income statements as a special charge against surplus income. In addition to the retrenchment in these special appropriations the St. Paul's ordinary maintenance accounts were decreased by $1,081,500, or $1,810,500 in maintenance, improvement and new equipment charges together. The increase in the cost of transportation was $1,170,500 but the increased cost of wages and supplies, particularly fuel, accounts for the major share of the expansion in this department. The fuel charge alone was 15½ per cent., or $465,300 more than in 1900.

Chairman Miller points out that "the payments of the company for labor directly employed in its service during the year were $15,916,128, as compared with $15,502,731 last year; and for material and supplies, $9,801,115, as compared with $11,647,630 last year."

In discussing the improvement policy of the company and the expenditures on that account, Mr. Miller presents the details of betterment expenditures, showing that $3,153,000 was appropriated by the company for improvement work. If these items, he says, were deducted from operating expenses, they would reduce proportion of working charges from the 66 per cent. shown in the income statement, to 55.4 per cent. of gross earnings, exclusive of taxes, which are 3.17 per cent. of receipts.

Capital expenditures in 1901 were $3,758,802, divided as follows: Construction of new lines, $2,186,329; construction of second main track, $256,337; real estate, $105,214; purchase of Milwaukee & Superior Railway, $341,174, and new locomotives and cars, $869,720. Treasury bonds for $4,100,000 were sold to reimburse the treasury for advances out of surplus earnings, but this issue does not increase the interest and amount outstanding as carried in the accounts as they were so charged up when the bonds were turned over to the treasury.

It is impossible to summarize the improvement and maintenance work of the year, but it may be pointed out that grade reductions were a costly part of the policy to secure economical working. Of this work, completed last year, $1,680,000 was charged against renewal fund.

Of course, the betterment of physical condition has helped to more economical results in handling traffic. These can be only briefly alluded to here. The average revenue train load is now 236½ tons, a gain of 27 tons over 1900, and the total train load has been increased 31 tons to 262½ tons. Freight train mileage is reported as less than in 1900, but the method of compilation seems to have been somewhat changed. Mixed train miles are not reported, being apparently divided between freight and passenger train mileage. Freight train mile earnings rose to $2.04, as against $1.94, despite the decrease in ton-mile rate.

Northern Pacific.—The past 12 months have been full of events of consequence to the Northern Pacific, which have permanently affected its history and development. It has acquired within that time absolute control of the great Burlington railroad, and, with the Great Northern Ry., now holds 98 per cent. of the Burlington's capital stock, against which joint bonds of the two companies have been issued on a basis of value of 200 per cent. for the Burlington shares. The bonds so far issued amount to $215.154,000. The success of this purchase roused the powerful interests controlling the Union Pacific, who made heavy purchases of Northern Pacific stock in the open market, which culminated in the May corner and the Wall street flurry. These purchases, it is now generally admitted, gave Union Pacific a majority of the outstanding Northern Pacific stock. Thus this great property, controlling and operating over 5,000 miles of road and earning in the 12 months to June 30 last $32,561,000, has practically no public stockholders, the shares being mostly held by one or the other of two great financial interests.

This change in the public status of its stock, however, in no wise affects the course of its financial, revenue and operating results in the past year, which have been of peculiar interest.

The increase in earnings as shown in the report is $2,540,000, and in net is $294,150. Figures in 1901 are based on an average of 5.100 miles of operated road, as against 4,714 miles in the previous year. Changes in mileage are accounted for in part by the lease effective May 31, of the Manitoba lines of 355 miles to the Provincial Government, on a rental fixed at $210,000 for the first 10 years, and increasing at the end of each 10 years until a maximum of $300,000 is reached. Addition of new branch lines more than offset deduction of these Manitoba lines. The new mileage is mostly in Washington and in North Dakota and amounted to 165 miles on eight different lines. Six branches, aggregating 127 miles, whose construction was authorized in the last fiscal year are now under construction to be completed in the current year. Prior liens bonds are available for the cost of these lines, which are fully merged with the other lines in the financial accounts as soon as open for operation.

Details of the 1901 income account would indicate that without the heavy expansion in passenger revenue, earnings would have shown a decrease for the year, allowing for changes in mileage. Freight earnings per mile of road did, in fact, fall off from $4,697 in 1900 to $4,604 last year, while passenger revenues gained $101 per mile of average operated road to $1,663 per mile. The course of earnings and expenses for the last three years is brought out in the following table:

	1901.	1900.	1899.
Miles operated	5,100	4,714	4,579
Passenger earnings	$7,017,823	$6,006,155	$5,050,355
Freight earnings	23,481,713	22,140,179	19,485,960
Gross earnings	31,962,501	30,021,317	26,048,673
Operating expenses	16,640,143	14,394,628	12,349,452
Prp. exp. to gross	51	47⅞	47½
Taxes	920,352	850,590	750,133
Net earnings	15,000,488	14,776,099	12,949,088
Total net income	15,744,275	15,461,620	13,950,695
Bond interest	6,395,681	5,864,950	6,079,273
Leased lines rent	134,690	112,851	61,520
Balance for divs	$9,213,903	$9,483,818	$7,809,901
Div. common stock	3,000,000	3,000,000	3,000,000
Div. preferred stock	3,200,000	2,400,000	1,600,000
Surplus	$3,013,903	$4,083,818	$3,209,901
Betterments	2,011,285	3,000,000	2,176,619
Net surplus	$1,002,618	$1,083,818	$1,033,282

Gross earnings and net earnings, less taxes, in previous years were as follows:

	Aver. miles.	Gross earn.	Net earn.
1898	4,362	$23,679,718	$11,901,547
1897†	4,375	14,941,818	5,356,965
1896	4,404	19,863,160	7,345,979
1895	4,469	17,434,981	5,613,582
1894	4,468	16,547,210	4,265,264
1893	4,443	23,920,109	8,985,997

†Ten months only, first report of reorganized company.

Average receipts per ton were 14⅓ per cent. less and the ton-mile rate 4½ per cent. less than in 1900. Mileage of loaded freight cars increased 5 per cent., and empty freight car mileage was 3¾ per cent. more, while the increase in freight train load was only seven tons. Mileage of revenue freight trains, excluding helping mileage, increased 440,000 miles, or 7¼ per cent. Then there was an increase of 22½ per cent. in revenue freight tons; and of 20½ per cent. in ton miles, but of only 125,000 miles, or less than 2 per cent., increase in revenue freight train mileage, while the addition to revenue freight train was over 50 tons. Certain of these figures for three years are brought out in the following table:

	1901.	1900.	1899.
Rev. tons moved	8,792,885	7,121,655	5,816,639
Rev. ton miles	2,440,663	2,205,317	1,830,855
Freight train miles	6,493,499	6,053,981	6,595,298
Freight eng. help miles	1,121,698	1,088,193	.....
Loaded frt. car miles	172,507,657	164,314,552	146,866,983
Total frt. car miles	236,281,092	225,801,003	197,274,226
Passengers carried	3,298,700	2,342,785	1,927,028
Passenger miles	308,819,600	255,680,585	213,209,800
Pass. train miles	4,930,530	3,549,206	3,768,864
Rev. frt. train load	324	318	278
Total frt. train load	381	379	336
Ton mile rate	0.944c	0.988c	1.047c
Passenger mile rate	2.27c	2.35c	2.53c
Frt. train mile rev	$3.12	$3.19	$2.95
Pass. train mile rev	$1.42	$1.66	$1.63
Freight train haul	278	310	315

As in previous years, improvement of the property was energetically prosecuted. These have been succinctly set forth in previous reports by Former Vice-President Kendrick, but the advance sheets now at hand do not describe the betterment work of the year except generally. President Miller says that in addition to $2,794,247 of equipment purchased and charged to betterment and enlargement funds (constituting additions to capital account) the company purchased or built and charged to operating expenses equipment valued at $306,520, to replace that destroyed and retired from service as no longer suitable for present requirements.

Improvement charges, paid for from special appropriations out of income 1901 and 1900, cost $2,191.340, and new equipment, $492,240, a total of $2,683,590 on the two accounts.

Missouri, Kansas & Texas.—This company's revenues in the last fiscal year were not only much the highest ever reported by the company, but the gains recorded were much larger than in any previous year. Gross receipts reached a total of $15,403.000, with a gain of $2,777,000, which is larger by $500,000 than the whole gain reported between 1894 and 1900. Little of this gain was held for net earnings. In that item the enhancement was only $407,000. Though the mileage at the end of the year was 258 miles more than a year ago the average of operated road was only 47 miles, so that the increase in receipts per mile is relatively as great as in the aggregate, being $1.108 per mile higher than in the previous year, or $6,800 gross per mile. Most of the gain was in freight receipts, largely due to better average rates, ton-mile revenue being 9.27 mills against 8.40 mills in the previous year.

Over half of the $2.350,000 enlargement in expenses was due to higher maintenance of way cost, the expansion in this department running up to $1,363,000. In cost of conducting transportation the increase, $665,400, or 11 per cent., bore little proportion to the growth of

traffic. This was represented by an increase of 127,800,000 ton-miles, or 11 per cent., in the freight department and of 22⅔ million passenger miles, an increase of 23 per cent. The course of expenses for several years past is brought out in the following table of the main items of the account:

	Maintenance of way.	Maintenance of Equipment.	Conducting Transportation.	Total.
1901.....	$2,815,606	$1,361,581	$5,922,286	$10,824,013
1900.....	1,452,452	1,098,199	5,256,907	8,474,130
1899.....	1,322,650	934,990	4,809,313	7,742,660
1898.....	1,324,051	900,506	5,019,370	7,009,228
1897.....	1,576,580	780,214	5,123,382	8,081,521
1896.....	1,550,250	837,228	4,578,255	7,419,814

The demands on the property for larger expenditures are obvious in the above figures. The management, while not directly referring to possibility of dividends, discusses the need of utilizing all the available resources of the company for further improving the physical condition of the property. In the near future, all the remaining bridges on the main line will be brought up to the standard of the heaviest equipment, and grades must be reduced so that maximum train loads can be run continuously over the line.

The character of the improvements carried through in 1901, as enumerated in the report, include 21 miles of embankment made standard width; 107 miles of track ballasted, 42 miles with burnt clay, 15½ miles with broken stone; 108 miles of 66-lb. rails relaid for lighter weights available for relaying elsewhere; 17 miles of new sidetracks were constructed, 82 miles of new fences built, additions made to shops, tools, stations, etc., and a timber-treating plant erected with a capacity of treating 3,000 to 4,000 ties a day by the zinc chloride process. In addition 2,000 cars were purchased and 37 engines are under contract.

Last year the operated mileage was increased 257 miles by building the San Antonio extension, 47 miles, and the Missouri Midland Railway, 8½ miles, and by consolidation with the Sherman, Shreveport & Southern Railway, 202 miles, heretofore owned by the company, but operated under a separate organization.

Space does not permit detailed reference to the success of the management in regulating train mileage, as traffic density has increased. It need only be pointed out, as indicating the general character of the statistics, that in the year the average revenue trainload was increased by 15 tons, to 212 tons, while in 1896 average trainload was only 149 tons.

NEW PUBLICATIONS.

Texas Petroleum.—The University of Texas (Austin, Texas) issues Bulletin No. 5, being "Texas Petroleum," by William B. Phillips, Professor of Field and Economic Geology and Director of the Survey. It is a pamphlet of 102 pages, with numerous illustrations and with maps. It is probable that this Bulletin can be had on application to the University.

Statistics of the Railways of the United States to June 30, 1900. Washington: Interstate Commerce Commission.

The thirteenth annual report of the Statistician of the Interstate Commerce Commission has just been issued. The principal totals in this report were given in the *Railroad Gazette* of July 19, 1901, page 509. (A preliminary report was issued in December, 1900.) The present report shows the taxes paid by railroads compiled by states, with the amount paid per mile of line within each state.

The Air-Brake Association.—The Proceedings of the eighth annual convention of the Air-Brake Association, held at Chicago in the spring, are now issued in a pamphlet of 268 pages. This may doubtless be had by addressing the Secretary, Mr. F. M. Nellis, of 95 Liberty street, New York City. The valuable reports and discussions of this Association were treated by us at more or less length at the time of the convention, and now it is only necessary to say that the collected report is available.

Index to the Transactions of the American Society of Civil Engineers. Vol. I to XLV. (1867 to 1901). Prepared under the authority of the Board of Direction by Charles Warren Hunt, Secretary. Octavo, 244 pages. New York: Published by the Society. 1901.

This valuable document is in two parts, a subject index of 105 pages and an author index of 131 pages. It is excellently arranged and printed. The reference words in the respective indexes are printed in bold type, and after the reference to the volume and to the page, the year of publication is also given, which is a matter of considerable convenience. To one who is familiar with the personnel of the Society it is interesting to glance over the volume to see the relative amount of the contributions of the various members to the index. This hardly measures their relative contributions to the *Transactions* for a comparatively short addition to a discussion is indexed. We should say, after a hasty examination, that Mr. Francis Collingwood was the most copious contributor as the references to his papers and discussions fill two pages. Probably the next longest list of references is that of the late Charles E. Emery, about a page and a half. Mr. Crowell, Mr. James B. Francis, Mr. Herring, Mr. J. L. Le Conte and Mr. North probably furnish each about the same number of references, namely, about a page. Mr. Cross comes close after them.

We learn from the Secretary that a limited edition has been printed and that it will be sold at $2. We should suppose that engineers and students would be glad to have this index, even when they do not have in their own libraries files of the *Transactions*.

TRADE CATALOGUES.

Steam Hot Blast.—The B. F. Sturtevant Company's catalogue No. 118 on this subject will be of value to those using such apparatus. Complete equipments for heating and drying are illustrated and plenty of information is given.

The Brown & Sharpe Mfg. Co., Providence, R. I., is distributing circulars and price lists of a new line of calipers and dividers recently placed on the market. The price list contains 12 pages, five of which are illustrated, and is entitled "Something New."

Sheet Steel.—The American Sheet Steel Co., New York, issues an illustrated catalogue of 64 pages showing its various steel plants and giving gage, weight and price of plain sheet and corrugated metal. The company states it will gladly send copies to those who will address the Advertising Department, Battery Park Building, New York, N. Y.

The Brown Hoisting Machinery Co., of Cleveland, Ohio, has issued an 18-page pamphlet descriptive of "Brownhoist" overhead tramrail and trolleys. The pamphlet is well illustrated and printed and contains prices of the various articles described. The company states that this circular has been issued because of a constantly growing demand for goods of this kind of high-class construction.

Westinghouse at the Pan-American.—The Westinghouse Companies have sent out a pretty pamphlet describing in a compact way what those companies are, giving illustrations of their product and telling something of their exhibit at the Pan-American. The pamphlet is intended for distribution at the Exposition and is a convenient memorandum of the 21 companies which are listed under this general name.

Electrical Drive for Shops.—The Northern Electrical Mfg. Co., Madison, Wis. (sales offices in the principal cities of the world), sends out a handsome pamphlet of 102 pages discussing and describing the use of electric motors for driving tools, hoists, cranes, etc., in shops and mills. The pamphlet is an unusually good one in the quality of its illustrations and in its descriptions, and is quite worth adding to one's technical library.

The Boston Belting Co., Boston, Mass., has just issued a handsome 164 page catalogue descriptive of mechanical rubber goods. As is well known to our readers, the company makes a large variety of articles of high grade and most of these are fully described and illustrated in the new catalogue. Considerable space is given to goods adapted to railroad work, including belting, diaphragms, gaskets, hose of all kinds, mats, matting, packings, treads for car steps and washers.

Steel Cars and Other Supplies.—The Sterlingworth Railway Supply Co., Easton, Pa., has sent a very handsome pamphlet illustrating (from photographs) the Sterlingworth steel car as built for the Delaware, Lackawanna & Western, the New York, Ontario & Western, the Mexican International and other roads. The flat and gondola cars, which are illustrated, are now quite familiar to our readers. The rolled steel box car of 80,000 lbs. capacity is less familiar. The same pamphlet shows the Sterlingworth truck, bolster and brake-beams.

Goodwin Cars.—The Goodwin Car Company, 96 Fifth avenue, New York City (115 Dearborn street, Chicago, and 213 Tremont Building, Boston) has issued a beautiful folio of 60 pages, substantially bound, showing the Goodwin car in many aspects and in great detail. It is quite unnecessary for us to describe the car itself. Those who do not understand it and who wish to understand it should get a copy of this publication. It contains instructions for operating the cars, descriptions of different classes of cars and brief accounts of various novel uses, as also of other inventions by Mr. Goodwin.

Compressed Air.—The Ingersoll-Sergeant Drill Co., Havemeyer Building, New York City, is distributing eight little pamphlets, each describing briefly the application of compressed air to a certain kind of work. The first of these, "Form 146," contains an illustrated description of the use of compressed air in the shops of the Monon Railroad, at Lafayette, Ind. The others, with their titles, are: Form 147, "Pumping Water by Compressed Air at Dixon, Ill."; Form 148, "A Model Compressed Air Foundry Plant"; Form 154, "Rock Drills"; Form 166, "Channeling and Quarrying Machinery"; Form 167, "Abundant Pure Water Underground"; and Form 169, "Air Compressors." Form 540 describes how the city of Rockford, Ill., save more than $3,000 in one year by using Ingersoll-Sergeant rock drills. The pamphlets contain from eight to 28 pages each, and are not intended to completely cover the subjects to which they are devoted but simply to give one a general idea of the extensive line of compressed air machinery made by the company and to invite correspondence.

TECHNICAL.

Manufacturing and Business.

Waddell & Hedrick, Consulting Engineers, Kansas City, Mo., have moved their offices from the Gibraltar Building to the New Nelson Building.

Dutilh-Smith, McMillan & Co. announce that they have removed their general offices from the Witherspoon Building, Philadelphia, to the Broad Exchange Building, New York City. This company controls the exclusive export trade of the American Car & Foundry Co. and American Steel Foundry Co.

At the annual meeting of the Franklin Air Compressor Co., held at Franklin, Pa., Sept. 2, the following Directors and officers were elected: Board of Directors, Charles Miller, J. W. Duntley, J. S. Coffin, W. P. Pressinger, S. A. Megeath, W. H. Forbes, C. J. S. Miller, S. C. Lewis, S. G. Allen; President, Charles Miller; Vice-President, J. W. Duntley; Secretary and General Manager, Samuel G. Allen; Treasurer, O. D. Bleakley.

At the annual meeting of the stockholders of the Locomotive Appliance Co., Chicago, the following directors were elected: J. J. McCarthy and Ira C. Hubbell, of Chicago; B. F. Hobart, Clarence H. Howard and C. A. Thompson, of St. Louis; J. B. Allfree, Indianapolis, and Robert Shriver, Cumberland, Md. At a subsequent meeting of the Directors, Ira C. Hubbell was elected President and Treasurer, Clarence H. Howard and J. J. McCarthy, Vice-Presidents, and W. H. England, Secretary.

The Scranton Bolt & Nut Co. has just let contracts for additional buildings and machinery to double the capacity of its bolt and nut departments. A new machine shop and blacksmith forge shop will also be built. The buildings will be of brick and approved frame factory construction to conform generally to the present structures and will give an additional floor space of 17,000 sq. ft.; it is expected they will be running by Jan. 1 next. The company, which manufactures the "diamond Z" brand of bolts and nuts and iron products, was organized in 1899. The first buildings were built in the summer of that year and enlarged in 1900.

The American Blower Co., Detroit, Mich., has received an order for the heating apparatus for the new car barn being built by the Scranton (Pa.) electric road.

The shipments made by the Pressed Steel Car Co. still keep up above the 100 mark. During the week ending Sept. 13 the company shipped 628 cars, an average of 105 cars a day. The company also is making large shipments of truck frames, bolsters, brake-beams and other pressed steel specialties. The company uses on an average over 1,600 tons of steel a day. In the four years during which the manufacture of pressed steel cars has been carried on, up to Sept. 1, 1901, the company has used about 1,657,080,000 lbs. of iron and steel in the construction of 46,030 cars. If these cars were placed end to end, allowing 35 ft. as the average length of the car and 2 ft. for the couplings, they would form a continuous train of over 322 miles.

Iron and Steel.

At the annual meeting of the stockholders of the Youngstown Sheet Iron & Tube Company, it was decided to increase the capital stock from $1,000,000 to $2,000,000, and to build a large open-hearth steel plant in Youngstown.

Messrs. Mackenzie & Mann, of Toronto, who have made an agreement with the Nova Scotia Government to build 200 miles of railroad, have intimated their willingness to take rails from the new mill of the Dominion Iron & Steel Co., at Sydney.

The new officers of the Republic Iron & Steel Co. are: President, Alexis W. Thompson; Vice-Presidents, John F. Taylor, Archibald W. Houston, William E. Taylor and William Barrett Ridgely; Treasurer, John F. Taylor; Secretary, W. B. Haagsma; Executive Committee: G. Watson French, Chairman; Alexis W. Thompson, John F. Taylor, Harry Rubens and William E. Taylor.

The tonnage of rails placed last week by several of the largest railroads of the country for delivery next year, according to the *Pittsburgh Despatch*, is estimated at more than 100,000 tons, and from inquiries already received the indications are that the early buying of rails will continue. This heavy buying has strengthened the market generally. The contract price on all the orders placed was $28 per ton, and it is probable that all the rail contracts specifying next year deliveries will be placed at this figure.

Preserving Timbers of Refrigerator Cars.

After a series of tests made under the direction of a well-known chemist, the Merchants Despatch Transportation Co. has adopted the "P & B" paint, made by the Standard Paint Co., 100 William street, New York City, for treating the sills and frame timbers of its refrigerator cars to prevent rotting from brine.

Hungarian Exports of Railroad Supplies.

A Hungarian car works, at Raab, has been filling contracts for considerable numbers of cars for railroads in Sicily and Egypt, and will ship 400 to Bombay; and a Hungarian rolling mill, at Resicza, has exported several thousand tons of rails to these countries. But a few years ago such exports would have seemed as strange for Hungary as for Oklahoma.

Franklin Air Compressor Co.

At the annual meeting of the Franklin Air Compressor Co., Sept. 13, the following officers were elected: President, Charles Miller; Vice-President, J. W. Duntley;

Secretary and General Manager, Samuel G. Allen; Treasurer, O. D. Bleakley. This Board of Directors was elected: Charles Miller, J. W. Duntley, J. S. Coffin, W. P. Pressinger, S. A. Megeath, W. H. Forbes, C. J. S. Miller, S. C. Lewis, S. G. Allen.

Innocuous Chlorine.

Chloride of lime is sometimes used for disinfecting cars, and when transported in packages not perfectly tight particles in the form of dust are apt to pervade the car. This is ruinous to paint and iron surfaces. At a recent conference of railroad managers in Austria it was reported that two companies had used, to disinfect this disinfectant, as it were, a chemical called "anti-chlorine" ($N_2S_2O_3$), with complete success. Washed with a solution of this, the chlorine odor disappears completely, and the destructive effects are neutralized.

Signal Notes.

The Philadelphia & Reading, having completed the equipment of its line between Reading and Harrisburg with Hall automatic block signals, has taken off one of the three brakemen on each through freight train running over that line.

The Commissioner of Railroads, of Michigan, has ordered the Pere Marquette and Grand Rapids & Indiana Railroad companies to construct and maintain interlocked semaphore signals at the crossing of their lines in the city of Grand Rapids.

Proceedings of the Master Mechanics' Association.

The Report of Proceedings of the Convention of 1901 of the Master Mechanics' Association are ready for distribution. The resources of the Association are from the dues and the sale of the Reports of Proceedings. As the convention this year was an unusually interesting one, the committee reports being very fully discussed, the proceedings, as printed, are of great value, and the railroad companies could very wisely distribute copies among their minor mechanical officers. The price of the proceedings is $1.50 per copy. The Index of Proceedings, prepared by the committee appointed at the convention of 1900, is ready for distribution at $1, plus postage (9 cents), when sent by mail.

New York Rapid Transit.

The Rapid Transit Subway Construction Co. has recently let contracts aggregating $1,500,000. The Allis-Chalmers Co. has a contract for eight 5,500 h.p. stationary engines, and the Babcock & Wilcox Co., a contract for 48 boilers of 600 h.p. each. The engines and boilers are to be shipped ready for use Jan. 1, 1904. General Manager E. P. Bryan, of the Construction Company, has announced that other contracts aggregating $1,500,000 will be let in a few days for electrical apparatus. There will be one main power house and eight sub-power stations. The sites for the stations have already been bought. No bids for the motors have been asked, nor is there any immediate likelihood of such a call.

The Brooklyn Bridge.

The report of Mr. Edwin Duryea on the Brooklyn Bridge has been handed to the District Attorney, by whom Mr. Duryea was designated for this duty. It appears now that Mr. Joseph Mayer has been associated with Mr. Duryea and that upon him has devolved most of the work of computation in this study. Of course nobody is more competent than Mr. Mayer for that part of the work. The findings of these gentlemen are not made public, practically all that the District Attorney having given out being the following paragraph from the report: "We believe the present margin of safety to be so small that the necessity for repairs is very urgent, and have suggested means by which the safety can be increased without materially interfering with traffic, and at comparatively small cost."

Rails for New South Wales.

We have repeatedly noted the attempts to establish in New South Wales the manufacture of steel rails and have recorded the absolute failure of all such efforts. A few months ago came the news that the Government had again asked for bids for 100,000 tons of rails to be made in the Colony, and to be delivered at the rate of 25,000 tons a year. No bids for these rails have been received. One stipulation was that the bidders should abide by the union rates of wages and the New South Wales minimum wage clause governing contracts and day labor. Another stipulation was that the price should not exceed at the time of delivery the lowest selling price in Great Britain or America plus the usual charges. It is supposed now that tenders will soon be called for in the United States and in England.

Dominion Iron and Steel Co.

In the annual report of the Dominion Iron & Steel Co., President Whitney says: "The work of construction has been rapidly pushed the past year. Two of the furnaces are finished and are producing iron of a very satisfactory quality. Investigations by drilling at Bell Island have revealed the fact that the quality of ore actually there is more rather than less than the original estimate. There has been expended up to the present time, including the sum paid for the purchase and equipment of the Bell Island Ore property, the sum of $9,571,054.41."

In his report to the president, General Manager Moxham says: "We have been considerably disappointed in the delay in completing the plant; nevertheless two of our blast furnaces are now in operation and the other two so near completion that their operation will not be long delayed. The 400 coke ovens have been completed. The blooming mill has most of the machinery in place and everything needed to complete it is on the ground. The open-hearth plant is being pushed by the contractors. The piers and unloading plants are practically completed. Product of the furnaces has been sent to 125 consumers in Canada, Scotland and the United States and the quality has given satisfaction."

Air-Brake Report for July, Nashville Yard.

Air-brake cars cut out, leaving Nashville yard:

Number of air-brake cars forwarded		7,802
Air-brake cars O. K.		7,749
Air-brake cars cut out		53
Average serviceable air-brake cars per train		15.6
Of the 53 cars cut, there were:		
Blowing at exhaust	Westinghouse	1
	New York	2
	Landsberger	7
	Boyden	3
	Crane	3—16
Blowing at vent port, New York		2
Check valve case gasket blown out		7
Graduating stem nut broken		1
Release valve leaking		6
Train pipe broken		1
Branch pipe broken		5
Brake rigging out of order		6
Flat wheels		9
Total		53

Of the 53 cars cut out, 39 belonged to railroad companies, 14 to private car lines.

Of the air-brake cars forwarded:

6,935 were equipped with apparatus of the Westinghouse Air-Brake Co.
852 with apparatus of the New York Air-Brake Co.
9 with apparatus of the Landsberger air-brake.
3 with apparatus of the Boyden air-brake.
3 with apparatus of the Crane air-brake.

Air-brake cars cut out coming into Nashville yard:

Blowing at exhaust	65
Blowing at vent port	18
Triple valves needed cleaning	82
Triple valve gasket blown out	3
Check valve case gasket blown out	21
Works emergency, service application	7
Triple valve piston packing ring broken or worn out	10
Graduating stem nut broken	1
Release valve leaking	12
Brake cylinder packing leather worn out	9
Train pipe broken	3
Branch pipe unions leaking	39
Flat wheels	20
Brake rigging out of order	31
Total	321
Cars leaving Nashville with brakes cut out	53
Cars repaired	268

THE SCRAP HEAP.

Notes.

Western newspapers report that the Atchison, Topeka & Santa Fe has used crude petroleum to lay the dust on the roadbed in the Mojave desert, and that the results are entirely satisfactory.

It is announced that on the Pennsylvania Lines West of Pittsburgh employees have been notified that the annual passes which they now hold will not be renewed next year, but that tickets for employees will be issued at about one-third the regular fare. This notice applies, we suppose, to the cases of employees whose work is in the large cities, Chicago, Pittsburgh, etc., and who reside a few miles out.

The Southern Pacific is having built at West Oakland a number of barges for use in transferring freight cars across the bay between the terminus of the railroad and San Francisco. Hitherto freight cars have been transferred by two large steamboats, similar to those used for transferring passenger cars, but these boats are now old and have nearly reached the limit of their usefulness, and it has been decided not to replace them, but to use tugs for motive power.

A statistician has discovered, and numerous newspapers are reporting, that a great many persons are killed on the railroads in Chicago. According to the United States Census the number of persons killed by steam cars in that city in the census year was 257 and by street cars 73; total, 330. For the same time the total in New York was 124; Philadelphia, 55; Buffalo, 59, etc. Comparison is made of the total population of these and other cities, which shows, of course, that the ratio in Chicago is very high. But the most significant fact which has a bearing on these figures—the enormous mileage of railroad in Chicago—receives no mention. Chicago has a much smaller population than New York, but it has more miles of railroad. No evidence is presented to show that the surface railroads are any more dangerous in Chicago than in other cities.

Traffic Notes.

Mr. George H. Heafford, late General Passenger Agent of the Chicago, Milwaukee & St. Paul, is President of the "World's Tourist Company," which is to open a tourist ticket office in Chicago.

The railroads west of Chicago, including both northwest in cold weather to seek a home, but as the lines to excursions twice a month until the end of this year. For these excursions the fares are half rate, plus $2. It is not claimed that any one wishes to go to the northwest in cold weather to seek a home, but as the lines to the south make low rates those to the north seem to think that they must do the same.

On Sept. 11 the Lake Shore & Michigan Southern secured injunctions at Cleveland against 43 ticket brokers of that city, restraining them from dealing in tickets for the G. A. R. Encampment, to be held in that city; and on the following day the other roads centering in the city secured similar injunctions. It is said that as soon as the scalpers were served with notices of the granting of the injunction at their regular places of business, many of them opened offices elsewhere, and continued to buy and sell tickets.

In their recent excursion rate-war the Ann Arbor and the Pere Marquette railroads appear to have exhausted the capabilities for travel of the people along their lines. For about a week the rival roads kept up a very lively war in excursion rates from their southern termini to Lake Michigan, and on Sept. 3 the excitement had reached a pitch where the Ann Arbor took passengers to Frankfort and back for 25 cents, the distance being nearly 300 miles, or 600 miles going and coming. But by that time the people had become satisfied with staying at home, or else had run short of small change, as the trains went out only partly loaded. Thousands of people had, however, taken advantage of the $5 and $2 rates. On one day the Ann Arbor road took on at Ann Arbor 300 passengers who went to that City from Detroit by the electric line. After each road had shown what it could do, rates were restored to figures which were somewhat reasonable.

The passenger fare from Spokane and other northern cities to San Francisco has heretofore included sleeping accommodations from Portland to San Francisco; but a new tariff has now been issued in consequence, it is said, of the union of interests of the Union and the Southern Pacific roads, by which this free privilege is done away with. In other words, a passenger riding in a sleeping car will now have to pay $5.50 more than heretofore, while those riding in day cars will pay 50 cents more. The former rate, all rail from Spokane to San Francisco, was $36.20 first class, with rebate of $8, and $26.20 second class, with rebate of $4. The distance between Spokane and San Francisco via the short line, is 1,206 miles. The first class sleeping car fare from Portland to San Francisco is $5, so that the railroads received but $23.20 for first class tickets, or less than 2 cents a mile. Under the new tariff the first class fare will be $36.20 with rebate of $7.50, sleeping car accommodations not included. The second class rate will be $26.20, with a rebate of $1, tourist sleeping car berth included, or an advance of $3 over the present rate. The rate from Spokane to San Francisco by rail and steamer from Portland is advanced to $26.20 first cabin and to $20.40 second cabin, meals and berths included on steamer. This is an advance of $4 first class and $6 second class.

Pennsylvania's New Piers.

Announcement was made in Jersey City last week that the Pennsylvania was about to begin extensive improvements at its property adjoining the Brooklyn Annex ferry South and extending from York street to Sussex street, Grand street intervening. These improvements will include two substantial iron piers for the use of the International Navigation Company and the Red Star Steamship line, both of which are controlled by Pennsylvania railroad interests. It was also announced that several new steamships 600 ft. long are being built for the Red Star line in Germany. The first of the new piers will be 150 ft. wide and will be at Grand and Sussex streets, and the second will be 100 ft. wide and will be at the foot of York street. Both piers will be two stories high and 700 ft. long.

The Engineer School of Application.

Plans are being prepared at Washington for additions and alterations to the buildings at the Washington Barracks, to adapt them to the use of the Engineer School of Application of the Army, which, as noted by us, p. 623, will shortly be transferred to Washington from Willett's Point, N. Y. It is considered an excellent site for the Engineer School. It contains about 70 acres of land, is at the extreme southern side of Washington, and is easily reached by two lines of electric cars. It is expected that the Engineer School will be established in its new quarters before Dec. 1, and its transfer is the first step toward the Army War College, for which plans will be prepared during the next three months, and for which Congress will be asked to make an appropriation.

The Biggest Gun.

The 16-in. gun is finished at the Watervliet Arsenal, ready to mount. Its projectile will weigh 2,400 lbs., and its range will be about 20 miles.

Snow Sheds Burned.

A despatch from Truckee, Cal., states that, on Aug. 21, fire destroyed about 3,000 ft. of snow shed in the Sierra Nevada Mountains at Lakeview, on the Southern Pacific. The fire was supposed to have started in a car of charcoal.

Technical Schools.

Mr. William S. Aldrich, heretofore Consulting Engineer, Toronto, Canada, has been appointed Director of the Thomas S. Clarkson School of Technology, Potsdam, N. Y. New instructors have been appointed for this school, additional equipment has been provided and the courses of study have been revised. There are four-year engineering courses in theoretical and practical work leading to the degrees of Bachelor of Science in civil, electrical and mechanical engineering.

J. G. Brill Company to Build a Plant in England.

The President of the J. G. Brill Company has lately said that the company had decided to build a factory in England. The question of the exact location is the main thing to be decided. Otherwise everything is settled. Some British capital will be interested in the enterprise.

Railroad Day at the Pan-American.

The celebration of Railroad Day at the Pan-American Fair in Buffalo, which was to have taken place on Saturday, Sept. 14, has been postponed to Sept. 28.

Sympathy From the Institution of Civil Engineers.

The American Society of Civil Engineers received from the Institute of Civil Engineers (London), under date of Sept. 17, the following cable despatch: "Mansergh, President, expresses the profound sorrow and sincere sympathy of the Institute on the tragic death of your honored chief, McKinley."

Railroad Observance of President's Funeral.

It was announced that on Thursday, Sept. 19, in memory of President McKinley, the Central Railroad of New Jersey would order that every train should be stopped for ten minutes while the funeral was in progress at Canton. Similar orders were issued by the Metropolitan Street Railway Company, New York City; also for the Hudson River Day Line (steamboats) and for street cars in Baltimore and Pittsburgh.

Elephants on the Track.

An elephant-catcher seems to be needed in India on the railroad between Bengal and Assam. As the Superintendent of the line was making an inspection trip over it on the night of July 17 last, while passing through the great Nambar forest, the train came to a stop with a jolt that threw the travelers out of their berths. It had run into a herd of wild elephants which were trotting down the track, the hindmost of which had both hind legs broken and was thrown into the ditch, while the engineman counted seven others which got away. This was not the first time that wild elephants had got on the track, and ordinary fences and cattle-guards are no protection.

Commerce Through the Canals at Sault Ste. Marie—August.

Eastbound:	
Copper, net tons	12,315
Grain, bushels	1,550,600
Flour, barrels	1,075,525
Iron ore, net tons	3,271,146
Lumber, 1,000 ft. B. M.	174,688
Wheat, bushels	2,100,230
Passengers, number	7,003
Westbound:	
Coal, hard, net tons	114,338
Coal, soft, net tons	661,885
Manufactured iron, net tons	26,263
Salt, barrels	54,779
General merchandise, net tons	71,363
Passengers, number	7,308
Freight:	
Eastbound, net tons	3,805,352
Westbound, net tons	882,465
Total freight, net tons	4,687,817
Vessel passages, number	3,231
Registered tonnage, net tons	3,994,296

Electrical Tramway and Lighting in Guayaquil.

The Municipal Council of Guayaquil has recently granted to a syndicate a charter authorizing the construction of an electrical tramway system in that city of some 50,000 inhabitants. The charter permits the use of any of the streets of the city and provides for the construction of a new race course, including a bicycle track, in the suburbs of the town. It also grants the use of electricity for lighting and power. The concession runs for 35 years, at the end of which time the tram and race course will revert to the city without compensation.

Coal and Water Station for the Reading.

The Philadelphia & Reading has let contracts to George W. Beard & Co. for a coal and water station in West Reading for the Reading Belt Railroad.

71,000-lb. Cars in England.

Two large capacity wagons were lately exhibited at the works of the Darlington Wagon & Engineering Company, Ltd. They have been built on the plans of Messrs. Sheffield & Twinberrow, Civil Engineers, of Newcastle, and include some devices patented by those gentlemen. One is a hopper wagon, built to carry 32 tons of coal, or similar material, and the other is an ordinary flat-bottomed wagon for goods. They are made of Siemens-Martin steel, and weigh something under 13 tons each. Although carrying a load equal to three ordinary wagons their individual weight is only equal to two 10-ton vehicles, thus a saving of one-third in weight is secured. The wagons are 40 ft. long, and have eight wheels on bogie trucks.

Electric Railroad Project at Carlsbad.

An electric street railroad company has been formed at Carlsbad, and negotiations with supply and construction firms are invited. Carlsbad is yet without any kind of public conveyance, except cabs and hotel omnibuses, though it has a permanent population of 15,000, to which are added between April and October of every year 40,000 or more sojourners. The city is spread out, along the Tepl River, a distance of several miles, from the railroad stations to the Posthof. Communications addressed to the Elektrische Strassenbahngesellschaft, Carlsbad, Bohemia, would reach the promoters of this project.

Casualties in Prussia.

In Prussia in 1899 the number of deaths by accidents of all kinds was 13,949; the deaths by accidents on the State railroads, which includes Hesse, as well as Prussia, were 578, of whom 335 were employees.

Women Railroad Hands in Hungary.

There has been for some time a movement among Hungarian State Railroad men to demand better pay and treatment. But this seems not to have included the women employees, who, under the name of "manipulators," are considerable in numbers and the worst paid of all. So the poor women have started a movement of their own. They say: "No one has so much cause for anxiety for his future as we poor manipulators; for it is no empty phrase but the bloody truth that of all who earn their living we are the most pitiable. We work, so long as work we can, for a wage so miserable that it barely saves us from dying of hunger, and then when we can work no longer, what awaits us? The beggar's staff; the poor house." They ask not only better wages, but retiring pensions, which most Continental railroad employees are entitled to.

The First Railroad in Germany.

The first railroad in Germany was the very short line from Nuremberg to Fürth. Its first locomotive was built by Robert Stevenson, in Newcastle, shipped thence to Cologne, and carted from there to Nuremberg. It made its first trip Nov. 16, 1835. The original drawings have been preserved, and the management of the Bavarian State Railroads has had a working model, one-tenth of the actual size, made and placed it in the Nuremberg railroad museum. It was a six-wheeled engine.

A Railroad Commissioner's Pleasant Duties.

The Commissioner of Railroads of Michigan recently received the following letter: "As you told me, if there was no word from the railroad company to let you know to-day, well there was no letter last night, so I send this note in, as I am caned away to help dig the grave for a woman hoping you will look into it at once and oblige."

LOCOMOTIVE BUILDING.

The National of Tehuantepec is having two engines built by the Baldwin Locomotive Works.

The Chicago Great Western has ordered 20 locomotives from the American Locomotive Co. These are in addition to the 20 referred to in our issue of July 19.

CAR BUILDING.

The Maine Central is having 100 freight cars built by the Laconia Car Co.

The Ozark & Cherokee is having 60 freight cars built by the Barney & Smith Car Co.

The Chicago Great Western has ordered 20 cabooses from the South Baltimore Car Works.

The Mather Stock Car Co. is having 13 freight cars built by the Illinois Car & Equipment Co.

The New Orleans & Northeastern is having four coaches built by the American Car & Foundry Co.

The Blackwell, Enid & Southwestern is having four freight cars built by the Mount Vernon Car Mfg. Co.

The Atchison, Topeka & Santa Fe is building, at its Topeka shops, a number of large tank cars for use in carrying oil from the Texas oil district.

The Louisville & Nashville will build 700 box cars at its New Decatur shops. This is in addition to the 250 flat and 250 coal cars previously referred to.

The Pennsylvania has ordered 300 box cars from the Pressed Steel Car Co., in addition to the 2,000 recently ordered, and 275 gondola cars from the Pullman Co.

The Vera Cruz & Pacific is having six coaches and 30 freight cars built by the American Car & Foundry Co. This is in addition to the three cars for passenger service noted in our issue of Sept. 6.

BRIDGE BUILDING.

AUBURN, IND.—The Commissioners of De Kalb County want bids until Oct. 9, for three steel bridges of various lengths. Address F. P. Seiler at Auburn.

BAY CITY, MICH.—Bids are wanted, until Sept. 21, for three stone abutments for a bridge over Perry Creek, on Garfield Road. W. D. Richardson, Deputy Clerk, County Road Commission.

BOONVILLE, IND.—Bids are wanted by the County Commissioners, until Oct. 7, for a steel bridge over Pigeon River, which is estimated to cost $1,100. M. Folsom, County Auditor.

BROOKVILLE, IND.—We are told that bids are wanted, Sept. 28, by G. Ray King, County Auditor, for steel work for a bridge over Whitewater River.

BUFFALO, N. Y.—U. L. Upson, General Manager of the Buffalo, East Otto & Cattaraugus Railway, 940 Ellicott Square, Buffalo, informs us that he will soon be ready to receive bids on two steel bridges needed on his road. One is to be 680 ft. long and 226 ft. high, over Cattaraugus Creek at Springville, N. Y. The other bridge is over a creek at Ashford. It is 180 ft. long and between 40 and 60 ft. high.

CHERRY BOX, MO.—W. W. Mitchell, Bridge Commissioner, Shelbyville, Mo., will let a contract at 2 p. m., Oct. 2, on the site of a proposed bridge over Salt River near Cherry Box. Address Mr. Mitchell for particulars.

EAST PROVIDENCE, R. I.—New bids will be wanted for the bridge at Roger Williams avenue, according to report.

EDISON, NEB.—Bids are wanted at the office of the County Clerk, T. F. Newton, Beaver City, until Oct. 1, for a steel bridge over Turkey Creek, four miles east of this place.

FREDERICTON, N. B.—Tenders are being taken by the Provincial Public Works Department for rebuilding several bridges.

GOUVERNEUR, N. Y.—The Black Lake Bridge Co. is reported incorporated, with a capital of $40,000, to build a bridge across Black Lake at Edwardsville. Ellery Colby is President. The Owego Bridge Co. is said to be making soundings for the structure.

IRON CITY, TENN.—F. M. Cannon, Chairman of the Bridge Committee, Lawrenceburg, Tenn., wants bids, until Oct. 5, for a steel highway bridge at Iron City, to consist of three spans, aggregating 324 ft. There will be 100 ft. of steel approach. Bids will also be opened on the same day for the masonry.

JEWETT CITY, CONN.—The New York, New Haven & Hartford will put a steel bridge over Pachaug River here, according to report.

KANKAKEE, ILL.—It has been voted to build a bridge across the Iroquois River at Sugar Island, between Otto and Aroma Townships. Estimated cost, $12,000.

LA CROSSE, WIS.—The Chicago, Milwaukee & St. Paul will rebuild its present bridge over the Mississippi River at La Crosse. The structure comprises five 145-ft. spans; three 163-ft. spans; one 250-ft. span, and one 360-ft. draw-span. The draw-span has recently been placed under contract with the Phoenix Bridge Co., and the five 140-ft. spans with the American Bridge Co. The other spans are not yet contracted for. In connection with this bridge there will be about 1,400 ft. of steel approaches, comprising 54-ft. and 64-ft. girder spans, which are not yet under contract. Some additional masonry substructures will be required, together with changes in the present substructures.

LANCASTER, PA.—Bids are wanted, until Oct. 14, by A. B. Hassler, County Controller, for a bridge over Little Beaver Creek, in the Borough of Quarryville.

LYNN, MASS.—The Chestnut street bridge over the Boston & Maine R. R., according to report, will be replaced by a new structure.

MANHATTAN, KAN.—We are told that bids are now being received and will be opened on Oct. 8, by J. D. Harshbarger, for a steel bridge 440 ft. long over Kansas River near Manhattan. J. W. Paul, County Surveyor.

MILES CITY, MONT.—A. H. Swerdfiger, County Clerk, will open bids, on Sept. 25, for a steel bridge about 615 ft. long over Yellowstone River, with 100 ft. of approach. The estimated cost is $40,000. Bids are to be accompanied by check for $7,000.

MONTPELIER, N. DAK.—Bids are wanted Sept. 21, by L. B. Niemeyer, County Auditor at Jamestown, for a steel bridge over James River.

MORTON, MINN.—Bids are wanted, Oct. 1, according to report, for the steel highway bridge over Minnesota River. J. T. Brooks, County Auditor, Beaver Falls.

NEMAH CITY, NEB.—Bids are wanted Oct. 1, for a bridge over Nemah River, according to plans on file with C. O. Snow, County Clerk, at Auburn.

NEW YORK, N. Y.—The Long Island Railroad will rebuild a number of bridges on the Port Jefferson branch. According to report, six bridges will be replaced, four of which will be of steel and two stone arches.

NORTHFIELD, MASS.—On Sept. 27 this town will sell $30,000 of bridge bonds.

OGDEN, UTAH.—Last week we mentioned that bids are wanted at the office of the County Clerk, until Sept. 23, for a steel highway bridge across Ogden River, at or near the mouth of Ogden Canyon. The bridge will be 100 ft. long from center to center of end pins, to be a steel Pratt truss of seven panel lengths. C. R. Hollingsworth is County Clerk.

ONONDAGA, ONT.—A steel bridge will be built over the Grand River connecting Onondaga with the Indian Reserve.

PENDLETON, ORE.—The Washington & Columbia River Railroad will replace a number of wooden bridges with steel structures on the line between Pendleton and Hunt's Junction.

PEORIA, ILL.—A bridge will be built over the East Creek in Waterford Township, according to report.

The Board of Park Trustees has decided to build a suspension footbridge at Glen Oak.

PITTSBURGH, PA.—It is said that J. W. Patterson, Chief Engineer of the Pittsburgh, Carnegie & Western, 331 Fourth avenue, Pittsburgh, will soon ask bids on the superstructure for the bridge over Monongahela River, which will cost about $1,000,000. Bollar & Hodge, New York, Engineers.

PLAINWELL, MICH.—The Gun Plains Township Board is considering building a new bridge on Main street, across the Kalamazoo River.

PLYMOUTH, IND.—Harry W. Miller, County Auditor, wants bids, until Oct. 8, for some bridge work in Tippecanoe Township.

RED DEER, N. W. T.—The Commissioner of Public Works is about to build a steel bridge over the Blindman River.

REVERE, MASS.—The Superior Court has confirmed the report of the Commissioners appointed to consider the abolition of the grade crossings on the Boston & Maine, in Winthrop avenue, Revere. The avenue will go over the tracks on a viaduct.

ROCHESTER, N. Y.—Plans are being made by the State Engineer at Albany, for the bridge over the Erie Canal at Plymouth avenue. (June 7, p. 387.)

ROSWELL, N. MEX.—The Commissioners of Chaves County want bids, until Oct. 7, for a steel bridge about three miles east of this place, to be about 400 ft. long.

ST. LOUIS, MO.—Chairman Rouse, of the Missouri, Kansas & Texas, is reported as saying that in the near future all remaining bridges on the main line will be brought up to standard of the heaviest equipment.

SALT LAKE CITY, UTAH.—The City Council is petitioned to build a viaduct over the railroad tracks at Second street, South, and Sixth street, West.

SAN LUIS OBISPO, CAL.—The City Engineer is making plans for a bridge at French street.

The County Surveyor is making plans for bridges over Villa and Old Creeks on San Luis, Cayucos-Cambria road.

SAN RAFAEL, CAL.—The City Engineer is making plans for concrete bridges on Colloden and Belle avenues.

SHARPSBURG, PA.—The Borough Clerk is about to advertise for bids for a bridge over Pine Creek on Bridge street.

SHELDON, MO.—Bids are wanted Sept. 24, by the County Commissioners at Nevada, Mo., for a steel bridge 153 ft. long over Horse Creek.

SYDNEY, N. S.—The Nova Scotia Steel & Iron Co. will build a bridge across the Bras d'Or Gut.

TERRE HAUTE, IND.—Plans are being made for a four-span steel girder bridge over Reservoir Lake north of Paris.

VICKSBURG, MISS.—The bids received on Sept. 4, for a steel bridge over Big Black River, were rejected and we are told new bids will be opened, on Oct. 2, by the Board of Supervisors of Warren County. W. Curphey, President, Board of Supervisors.

WARSAW, IND.—The County Auditor will receive bids until Sept. 27, for two steel bridges near Warsaw. Address Melvin A. Wilcox.

WASHINGTON, D. C.—R. B. Pegram, Assistant General Manager of the Southern Ry., will open bids, on Sept. 20, for six steel bridges, varying in length from 102 ft. to 710 ft. All are to cross streams in Alabama. The foundations for the bridges are already in.

WEBSTER, MASS.—The New York, New Haven & Hartford, according to report, will build a bridge over French River.

WHITMAN, MASS.—A contract will soon be let for a steel highway bridge over the New York, New Haven & Hartford tracks at Washington street.

ZANESVILLE, OHIO.—We are told that only one bid was received, on Sept. 9, for the superstructure of the draw-span for the Y bridge at Zanesville. Contract not awarded. Address the County Commissioners.

Other Structures.

BRISTOL, TENN.—The President of the Norfolk & Western is reported as saying that the company is negotiating with the Southern Ry. toward building a joint union station in Bristol.

BROOKLYN, N. Y.—The Brooklyn Rapid Transit Co. will build a power house at Fulton street and Brooklyn avenue. Plans are approved by the Building Department.

CRAIGSVILLE, VA.—The Virginia Portland Cement Co. will double the capacity of its 800-barrel cement works. Additions will be built to the boiler and stock house, and new machinery will be added. The New York office is 81 Fulton street.

HEARNE, TEXAS.—Plans have been finished for a station for the Houston & Texas Central, at Hearne.

MACON, MO.—The Chicago, Burlington & Quincy will build a passenger station here.

MARQUETTE, MICH.—The Marquette & Southeastern R. R. has bought a site at Main and Lake streets, in this city for a passenger station. This company will also build a freight depot, but no location is selected.

MOLINE, ILL.—The roundhouse of the Chicago, Rock Island & Pacific, which now accommodates 20 locomotives, will be extended to house double that number.

OSWEGO, N. Y.—Contract for the new roundhouse for the Lackawanna, at Oswego, is awarded to Robert Barnett & Co.

PITTSBURGH, PA.—Plans are reported finished for a passenger station for the Pennsylvania on Twelfth street.

SALT LAKE CITY, UTAH.—The building in which the general office of the Oregon Short Line is located was burned on Sept. 10. The loss is estimated at about $250,000.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvii.)

American Society of Civil Engineers.

The regular meeting of the American Society of Civil Engineers, which was to have been held Sept. 18, has been postponed to Sept. 25 at 7:30 p. m., on account of the death of the President of the United States.

The Engineers' Club of Philadelphia.

A business meeting of the Club, the first fall meeting, will be held on Saturday, Sept. 21, at 8 o'clock, p.m. The paper will be "The Protection of Lowlands Against Tidal Overflow," illustrated, by Percy H. Wilson.

International Ticket Agents' Association.

This Association held its tenth annual meeting at Toronto last week. The President of the Association for the ensuing year is J. A. Robbins, of Chicago; Secretary, C. G. Cadwallader, Philadelphia. The name of the official publication of the Association will hereafter be the "International Railway Journal."

New York Railroad Club.

The Secretary has sent out the following notice: "As a token of respect to this nation's late Chief Executive, the officers of the Club have ordered postponed for one week the meeting originally scheduled for Thursday evening next, 19th inst. The next meeting will, therefore, be held 8 p.m. of Thursday, Sept. 26, when the paper on "Brakes in Railroad and Street Car Service" will be presented.

A specially good meeting is expected. Some of the best brakemen of the country will be there outside the Club's membership, and on a subject of such special importance to the street railroad members much profitable discussion should ensue.

New York Street Railway Association.

The nineteenth annual convention of the New York Street Railway Association adjourned at Rochester, N. Y., Sept. 11, after electing the following officers, and selecting Caldwell, on Lake George, as the convention place for next year: President, G. Tracy Rogers, of Binghamton; First Vice-President, E. J. Connette, of Syracuse; Second Vice-President, Addison B. Colvin, of Glens Falls; Secretary and Treasurer, Henry A. Robinson, of New York City.

The following Executive Committee was elected: H. H. Vreeland, Metropolitan Street Railway, New York City; W. Caryl Ely, Buffalo Traction Company; T. J. Nicoll, Rochester Railway Company; Jacob L. Greatsinger, Brooklyn Rapid Transit Company.

Roadmasters' and Maintenance of Way Association.

The Nineteenth Annual Convention of this Association will be held in Washington, D. C., Oct. 8, 9 and 10, 1901. Committees have been appointed to report on the following subjects:

Tie Plates.—J. C. Hechler, G. R. M., D. & R. G., Pueblo, Colo.

Does Chemical Treatment of Ties Increase the Hardness of the Wood and the Holding Power of the Spike?—J. C. Rockhold, R. M., S. F. & S. J. V., Stockton, Cal.

Surfacing Track.—M. Sullivan, R. M., M. C. R. R., Niles, Mich.

Tamping of Ties.—R. P. Collins, R. M., N. Y., N. H. & H., Readville, Mass.

Burned Clay Ballast.—William Shea, R. M., C., M. & St. P., Blakesburg, Iowa.

Are the Best Results Obtained from the Use of Broken or Square Joints, on Both Double and Single Track?—L. Bradley, R. M., A., T. & S. F., Emporia, Kan.; F. J. Allen, R. M., C., B. & Q., Aurora, Ill.

Results Obtained from the Use of Forty-Five and Sixty Feet Rails.—F. R. Coates, Chief Engineer, C. G. W., St. Paul, Minn.

Ballasting.—W. E. Emery, R. M., C. & N. W., West Chicago, Ill.

The Rail.—W. T. Manning, Consulting Engineer, B. & O., Baltimore, Md.

To Arrange for the Nineteenth Annual Convention.—S. B. Rice, R. F. & P. R. R., Ashland, Va.

Master Mechanics' Association.

At a meeting of the Executive Committee of the American Railway Master Mechanics' Association, held Aug. 15, the following committees for conducting the work of the Association for the year 1901-1902 were selected:

1. Ton-Mile Statistics.—H. J. Small, Chairman; C. H. Quereau, W. H. Marshall, George L. Fowler.

2. What Is the Cost of Running High-Speed Passenger Trains?—Wm. McIntosh, Chairman; J. F. Deems, G. F. Wilson, Prof. W. F. M. Goss.

3. What Should Be the Arrangement and Accessories of an Up-to-date Roundhouse?—Robert Quayle, Chairman; V. B. Lang, D. Van Alstine, G. M. Basford.

4. Present Improvements in Boiler Design and Best Proportions of Heating and Grate Surface for Different Kinds of Coal.—George W. West, Chairman; T. W. Demarest, H. D. Taylor, M. N. Forney.

5. Standard Specifications for Locomotive Driving and Truck Axles.—A. E. Mitchell, Chairman; S. Higgins, W. S. Morris, L. R. Pomeroy.

6. Internal Combustion Engines in Railroad Work.—R. P. C. Sanderson, Chairman; M. K. Barnum, C. M. Mendenhall, John A. Hill.

7. Subjects.—A. E. Manchester, Chairman; Howard Stillman, Alfred Lovell.

In addition to the above it is expected there will be three or four papers by individual members of the Association; and these, together with the topical discussions, will complete the programme for the work of the next convention.

The American Street Railway Association.

The following are the papers to be presented at the twentieth annual meeting, which will be held in Madison Square Garden, New York City, Oct. 9, 10 and 11: "Street Railways: A Review of the Past and a Forecast of the Future;" "The Adoption of Electric Signals on Suburban and Interurban Railways, Single or Double Track, and Their Economy of Operation," "The Value of Storage Batteries as Auxiliaries to Power Plants," "The Public, The Operator and the Company," "The Best Manner and Mode of Conducting the Return Circuit to the Power House," "The American Street Railway Association: The Purposes of Its Organization and the Benefits Accruing to Investors in and Operators of Street Railway Properties by Membership Therein," "The Economies Resulting from the Use of Four Motors Instead of Two on Double Motor Equipments," "The Best Form of Car for City Service: A Consideration of the Various Types of Car as to Size of Car and Arrangement of Seats, Including Best Types of Brakes and Wheels," "Practical Results Obtained from Three-Phase Transmission and Rotary Transformers or Motor Generators in Transmitting Power on Railway Lines," "Relations of Interurban and City Railways," "The Modern Power House, Including the Use of Cooling Towers for Condensing Purposes."

It is expected to have the largest exhibition of street railroad supplies every shown, as all space in Madison Square Garden has been taken. The annual banquet will be held Oct. 11. The headquarters of the association will be at the Murray Hill Hotel. Walton H. Holmes, President; T. C. Penington, Secretary, 2020 State street, Chicago, Ill.

G. P. A. Annual Meeting.

The American Association of General Passenger and Ticket Agents will hold its 46th annual meeting at Battery Park Hotel, Asheville, N. C., Oct. 15. The principal questions to be considered are the following: Anti-Ticket Scalping Legislation; report from the committee, Mr. Daniels, chairman. Report from special committee on "Perfect Safety Paper," Mr. Ruggles, chairman. A Protective Bureau Committee. Open Parliament. Admitting chairmen of Traffic Associations. Addition of an insurance feature to the association. Referred to a committee, Mr. Cummings, chairman. Placing orders for prepaid tickets by wire. Placing of orders by foreign line in territory having ample ticket representation. Discontinuance of brass checks for local and foreign baggage. A report from the General Baggage Agents' Association. Desirability of issuance of rate sheets half yearly, May 1 and Nov. 1, instead of quarterly. Transportation of excess baggage. Report from General Baggage Agents' Association. Uniformity in punching dates in coupon tickets. Standard method of printing going and return limits to be punched in contracts of round-trip tickets.

In response to the secretary's circular of Aug. 15 subjects for consideration have been received as below:

By Mr. E. A. Ford:—What methods should be adopted by steam railways, if any, in the matter of meeting electric line competition. By Mr. Ussher:—The pro-rate per rate principle. By Mr. Kniskern:—To have dates of important national-meetings, such as N. E. A., G. A. R., Y. P. S. C. E., shown in Travelers' Official Guide. Compendium of passenger rates and divisions to be given renewed recognition by the association. Further changes in manner of punching standard form of round trip tourist tickets. By Commissioner F. C. Donald, Central Passenger Association:—Showing final destination on contract and each coupon of interline tickets.

The Engineering Congress at Glasgow.

In connection with the Glasgow Exposition an International Engineering Congress was held Sept. 3 to 5, inclusive. The sections were: Section I., Railroads; II., Waterways and Maritime Works; III., Mechanical; IV., Naval Architecture and Marine Engineering; V., Iron and Steel; VI., Mining; VII., Municipal; VIII., Gas; IX., Electrical. The programme of papers for Section I., Railroads, is published in another item. The chairman of Section II., Waterways and Maritime Works, is Sir John Wolfe Barry. The papers are by Mr. Isham Randolph, on "The Plant Used on the Chicago Drainage Canal;" by Mr. Ockerson, on "The Lower Mississippi;" by Mr. Alston, on "The River Clyde and the Harbor of Glasgow;" by Mr. Willcox, on "Irrigation in the Nile Valley;" also papers on the "Dortmund and Ems Canal," on "Recent Improvements at the Outlet of the Danube," on "The Harbor of Bilboa," etc.

In Section III., Mechanical, the chairman is Mr. William H. Maw, and the papers include "Trials of Steam Turbines for Driving Dynamos," by Parsons and Stoney; "A Compound Locomotive on the Buenos Ayres Great Southern," by Gould; "A 100-Ton Universal Testing Machine at Glasgow University," by Wicksteed;" Pneumatic Riveting, Etc." by Taite, etc.

In Section IV., Naval Architecture and Marine Engineering, the chairman is the Earl of Glasgow. There will be papers by Sir Nathaniel Barnaby, Professor Biles and four or five other writers.

Section V., Iron and Steel, the chairman is William Whitwell, Esq. Here Professor Hartley and Mr. Ramage present a paper on "The Spectra of Flames During the Basic Bessemer Blow;" Mr. Thwaite, a paper on "The Utilization of Blast Furnace Gases;" Mr. Wahlberg, on "Carbon and Phosphorus in Steel Ingots," and there are a number of other papers mostly on metallurgy.

Section VI., Mining the chairman is Mr. James S. Dickson. Mr. Keighley has a paper on "Coke as Made at the Oliver & Snyder Steel Company's Plant." There are papers on "Colonial Gold Fields," and several other papers of special interest to mining engineers.

Section VII., Municipal, chairman, E. George Mawbey. There are papers on "The Treatment of Sewage, Sewage Disposal, Municipal Sanitation, Waterworks, Etc."

Section IX., Electrical, chairman, W. E. Langdon. Among a group of papers on more or less interesting details we find one on "High Speed Railroads," by Herr Lasche, of Berlin.

The programme of the Congress includes 31 stated visits to works of interest in the vicinity of Glasgow, which would apparently leave but a moderate amount of time for the formal sessions. Fortunately, the lists of papers are short, and furthermore, they do not look very interesting.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. John L. Truslow died Sept. 5 after a prolonged illness. He was a native of Virginia, having been born at Wytheville in 1845. He began his railroad career in 1866 on the East Tennessee & Georgia, and was at one time General Agent of the Atchison, Topeka & Santa Fe, having been employed with this company for several years.

—Mr. James Geddes, Assistant to the General Manager of the Louisville & Nashville, was born at Portsay, Scotland, 73 years ago. He entered railroad service in 1846 in the civil engineering department of the Great Western Railway (England). In 1851 he took the position of Civil Engineer on location and construction of the Louisville & Nashville and has served this company continuously for 50 years. From Civil Engineer he became Agent at Bowling Green, Ky., then Division Superintendent and finally Assistant to the General Manager.

—Mr. L. R. Pomeroy (recently with the Schenectady Locomotive Works) a few weeks ago entered the service of the General Electric Company as a special agent of that company in railroad matters. As we understand it, he will have principally to do with questions of the uses of electrical machinery on existing steam railroads, as, for instance, electric drive in shops, electric motive power for traction and machinery for turning drawbridges and the like. Of course, it is unnecessary to say to the readers of the *Railroad Gazette* anything about Mr. Pomeroy or his history, as he has been a familiar figure in railroad matters for a good many years.

—Mr. Datus Chase Brooks, who, with Stanley G. Fowler, founded the Chicago *Railway Review* in 1868, and edited that journal until 1876, died at Saranac, N. Y., Aug. 1 last. He was born near Auburn, N. Y., about 1831, but from early childhood lived in Michigan. He graduated at the University of Michigan, with the class of 1856, and served in the faculty of that institution until 1864, most of the time as Assistant Professor of Rhetoric and English Literature, and one year as Librarian. From 1864 until he began the *Railway Review*, he was employed as musical, dramatic and art critic of the Chicago *Times* and an editorial writer on the Chicago *Evening Post*. As an editor he was widely known among railroad officers in the West. For eight years after leaving that special work he was editor of the Omaha *Republican*, and for a time was connected with the Council Bluffs *Nonpareil*. Prof. Brooks was a man of fine tastes and many accomplishments. He leaves one child, the wife of Edwin Emerson, Jr., a New York literary man and journalist.

—Mr. A. E. Mitchell has resigned as Mechanical Superintendent of the Erie Railroad. Mr. Mitchell is one of the best known of the mechanical officers on the railroads of our country. He was graduated as Mechanical Engineer from the Maine State College in 1875, served a year as an apprentice in the Baldwin Locomotive Works, then entered the Altoona shops. He served on the Pennsylvania until July, 1881, and then for a year was with the Yale & Towne Manufacturing Co. For four years he had a variety of service with railroads and manufacturing concerns, and in November, 1886, entered the service of the Erie, with which road he has remained ever since. There he has been Engineer of Signals, Engineer of Tests, Mechanical Engineer, and since 1892 Superintendent of Motive Power, or, as the title now is, Mechanical Superintendent. As an officer and a committee man he has done a variety of useful work in the mechanical associations and the New York Railroad Club. Under his administration the motive power and rolling stock of the Erie have been practically revolutionized, and are now in a high state of efficiency. We have not yet learned whether or not he will retire from railroad service, but hope that he will not.

—Not a great while ago we mentioned the fact that Mr. C. B. Elliott, General Manager of the Cape Government Railways, had retired after 40 years of public service and is now in England and about to visit the United States, making special studies. Mr. Elliott's distinguished service has lately been recognized by the King in making him a Knight Commander of the Order of St. Michael and St. George, that is, K. C. M. G. Therefore, he is now Sir C. B. Elliott. Sir Charles Elliott began his work in South Africa as a clerk in 1859, and in 1867 he was a clerk in the Colonial Office. Later he became a justice of peace and an acting resident magistrate, and in 1872 was Chief Clerk to the Commissioner of Crown Lands and Public Works. He has served in many public positions and became the General Manager of the Cape Railways, Dec. 16, 1880. Sir Charles Elliott is succeeded by Mr. T. R. Price, who has recently been made a Companion of St. Michael and St. George, or C. M. G. He had considerable experience on the Great Western Railway in England, and, in 1880, went out to Cape Town, where he became Acting Assistant Traffic Manager. He has been connected with the Colonial Railroads ever since.

Mr. David Hunter, General Manager of the Government Railways in Natal, has been made a K. C. M. G. also, in recognition of his zeal and ability in handling the railroads of that colony during the war.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—The jurisdiction of E. H. Bankard, Purchasing Agent of this company, has been extended over the Baltimore & Ohio Southwestern, effective Oct. 1.

Central of New Jersey.—W. W. Wentz, Jr., heretofore Superintendent of the New Jersey Central and Lehigh and Susquehanna Divisions, has been appointed Acting General Superintendent, succeeding J. H. Olhausen, who has been granted leave of absence. M. M. Richey, heretofore Superintendent of Terminals, has been appointed Division Superintendent, succeeding Mr. Wentz. The position formerly held by Mr. Richey has been abolished, effective Sept. 18.

Choctaw, Oklahoma & Texas.—S. J. Haydon, heretofore Auditor of the Choctaw, Oklahoma & Gulf, has been appointed Treasurer and Auditor of the C., O. & T., with headquarters at Amarillo, Texas.

Duluth, Missabe & Northern.—W. J. Olcott, heretofore First Vice-President, has been elected President, succeeding F. T. Gates, resigned. C. E. Scheide has been appointed Assistant Treasurer, succeeding G. D. Rogers, resigned, and C. D. Fraser becomes Assistant Secretary, succeeding E. V. Carey, resigned.

Erie.—A. E. Mitchell, Mechanical Superintendent, has resigned. The position of General Superintendent of the Ohio Division, formerly held by Mr. Mozier (page 643), has been abolished and the duties of this office will hereafter be performed by H. E. Gilpin, Assistant General Manager of this division, and G. Van Keuren, General Superintendent of Transportation. I. Bond, heretofore Division Master Mechanic, with headquarters at Hornellsville, N. Y., has been appointed Division Master Mechanic, with headquarters at Rochester, N. Y., succeeding F. Tuma, who has been appointed Division Master Mechanic at Port Jervis, N. Y., succeeding J. Hainen, who, in turn, becomes Division Master Mechanic at Elmira, N. Y.

Florence & Cripple Creek.—Frank Singer has been made Master Mechanic, with headquarters at Canon City, Colo., succeeding Robert Patterson.

Great Northern.—N. C. Chapman has been appointed Assistant Superintendent of the St. Cloud & Fergus Falls Division, with headquarters at Melrose, Minn., succeeding L. W. Bowen, promoted. (See E. & A., page 643.)

L. W. Hill, President of the Eastern of Minnesota, has been appointed Assistant to J. J. Hill, President of the G. N.

Gulf & Ship Island.—We are informed that the reports, widely circulated, that T. P. Hale, Second Vice-President and General Freight and Passenger Agent, is to resign, and that R. Morgan, General Superintendent, has been appointed General Manager, are absolutely without foundation.

Kansas City, Memphis & Birmingham.—W. H. Churchill, Division Superintendent, with headquarters at Amory, Miss., has resigned.

Montana.—F. T. Robertson, Superintendent, has been appointed Chief Engineer, also.

Nashville, Chattanooga & St. Louis.—W. Role has been elected a Director, succeeding the late G. M. Fogg.

Rock Island & Peoria.—D. W. Cunningham has been appointed Master Mechanic, with headquarters at Peoria, Ill., succeeding A. McCormick, resigned.

St. Louis, Kennett & Southern.—W. E. Harrington has been appointed General Auditor, succeeding F. M. Dozier, resigned.

Santa Fe Pacific.—A. G. Wells, who has been Acting General Manager, has resumed his former position, that of General Superintendent of the Lines West of Albuquerque.

Seaboard Air Line.—Walter Hale has been appointed Superintendent of the Fourth Division, with headquarters at Savannah, Ga., succeeding Cecil Gabbett. Charles H. Hix becomes Superintendent of the First Division, with headquarters at Raleigh, N. C., succeeding T. W. Whisnant, resigned, effective Sept. 15. We are informed that R. E. L. Bunch has not resigned. Of course it follows from this that W. G. Coleman has not been appointed General Passenger Agent. Mr. Bunch has, recently, been very ill with typhoid fever, but expects to resume his duties in a short time.

Spokane Falls & Northern.—H. A. Kennedy, heretofore Assistant General Superintendent of the Western District of the Great Northern, has been elected Vice-President of the S. F. & N.

Tennessee Coal, Iron & R. R.—George S. Tyler has been appointed Traffic Manager, with headquarters at Birmingham, Ala.

Terre Haute & Logansport.—The headquarters of F. T. Hatch, Superintendent and Chief Engineer, and V. K. Hendricks, Engineer Maintenance of Way, are to be removed from Terre Haute, Ind., to Logansport.

Toledo & Ohio Central.—At a meeting of the Board of Directors, held Sept. 10, the following officers were elected and appointed: Decatur Axtell, Chairman of the Board; N. Monsarrat, President; Charles G. Hickox, First Vice-President; J. M. Ferris, Second Vice-President and Secretary; James H. Hoyt, Assistant to the President; L. D. Kelley, Treasurer and Assistant Secretary; J. Landgraf, Jr., Auditor, and Doyle & Lewis, General Counsel. Messrs. Axtell, Monsarrat, Hickox, Ferris, Kelley and Landgraf, were elected to similar positions on the Kanawha & Michigan. M. S. Connors has been appointed General Superintendent, in charge of the transportation, mechanical and maintenance of way departments, succeeding T. F. Whittelsey, resigned.

White Pass & Yukon.—E. C. Hawkins, General Manager and Chief Engineer, has resigned.

Wiggins Ferry Co.—F. H. Leslie has been appointed Purchasing Agent.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Baltimore & Ohio.—The contract for grading the new coal road in Quemahoning County, Pa., has been awarded to the Ferguson Contracting Co., New York. The maximum grade, westbound, is 2 deg., and eastbound is $^{9}/_{10}$ per cent. compensated.

Contracts have been let to C. E. Stewart, of Westminster, Md., for seven miles of extension between Confluence and the east end of Brook Tunnel. This line will not parallel the present track, but will be two miles longer in order to reduce the eastbound grade from 50 to 36 ft. per mile. The present single track will be used as a westbound track.

The work between Rockwood and Pinkerton Tunnel will be done by F. H. Clement & Co., and comprises eight miles of construction.

Contracts have been let for the partial completion of the double tracking of the Pittsburgh Division between Cumberland and Pittsburgh, Pa. The 29 miles between Mt. Savage Junction and Sand Patch have just been finished, leaving 26 miles between Rockwood and Indian Creek, which is to be double tracked during the next two years.

A contract has been let to Serpell & Co., of Louisville, for the building of the New England Branch from Sayre, Ohio, to the new Hocking coal field being opened by the New England Coal Co. A tunnel 200 ft. long, and 4½ miles of track are to be built. (Official.)

Bids were opened in Akron, Sept. 5, for improvements on the Akron Division, between that city and Chicago Division, to cost $200,000. The entire distance is to be double-tracked, among other work done.

Brunswick & Birmingham.—This line, projected between the points named, has been surveyed as far as Bessemer, Ala., and graded for about 40 miles. In connection with the Seaboard Air Line, 20 miles of road have been completed. No outside contracts have been let as the work is being done by the road. The grading is average, and there will be no difficult structures until the Alabama line is reached. (March 22, p. 209.)

Canton, Massillon & Akron (Electric).—The contract for grading 10 miles of this line north from Canton, Ohio, has been let to Contractor Guard, of Monroe, Mich. The contract for the 10 miles south from Akron has already been let, and sections in between have also been let to Contractor Severling.

Carolina & Northwestern.—Contracts are said to have been let for 12 miles of road near Lincolnton, N. C. The Carolina & Northwestern, now in operation between Chester, S. C., and Lenoir, N. C., 109 miles, is being changed to standard gage and laid with 60-lb. rails. Extensions further north are said to be under consideration.

Central of Georgia.—A line is being surveyed into Tallapoosa County, in the neighborhood of Ashland, Ga. The proposed route runs along Hatchet Creek, near Goodwater, and is to go on as far as Ashland. (Construction Supplement, March 8, 1901.)

Central Railway of New Brunswick.—The 15-mile line incorporated under the name of the New Brunswick Coal & Railway, is a branch of the above into the coal mining area which extends from Grand Lake to New Castle, on the Intercolonial. The Central Railway of New Brunswick runs from Norton, on the Intercolonial, northwest 45 miles to Chipman, and the Chief Engineer of this new branch, E. G. Evans, is also the Chief Engineer of the Central. (Aug. 30, p. 612.)

Colfax & Northern.—See Shreveport & Red River Valley.

Colorado Springs (Electric).—It is said that this company will extend a line from Ouray, Colo., 25 miles to coal mines, and rights of way have been asked.

Denver & Northwestern.—The contract to grade the first three miles of this Colorado line, between Berkeley and Arvada, has been let to J. A. Osner, for $11,200. (June 21, p. 447.)

Denver & Northwestern (Electric).—Bids have been received for the construction of the first three miles of this line, which is to connect with the Denver Tramway Co., at Berkeley, Colo., to run a line to Boulder by way of Arvada and Louisville, Colo., with branches, a total of about 35 miles northwest.

Detroit, Pontiac, Lapeer & Northern (Electric).—This company has been incorporated in Michigan, with a capital stock of $1,000,000, to build an electric line from Detroit to Bay City by way of Pontiac, Lapeer, Mayville, Caro and Akron, a distance of about 120 miles northwest. The stockholders are: James Dean, Orrin J. Price and E. S. Greece, of Detroit; L. F. Morehouse, Ann Arbor, and D. R. Curry, Rochester.

Granville & Poultney.—See Whitehall & Granville below.

Kansas, Missouri & Southeastern.—It is said that this company will build from Pittsburgh, Kan., to Bald Knob, Ark., and that the line has been surveyed from Pittsburgh to Butterfield, Mo., 65 miles. (Aug. 23, p. 596.)

Kentucky Roads.—It is said that the Kentucky Lumber & Veneer Co. will build a narrow gage road 16 miles long to reach timber lands in Kentucky, near Jackson.

Keokuk & Western.—See Chicago, Burlington & Quincy.

Kootenay Central.—The route chosen by this proposed road lies along the Kootenay River Valley and then in a northwestern direction, following the foothills of the Rockies. Taking Fort Steele as a radiating point, the first section of the road will be carried through that town to the Crows Nest Ry. line, south. The second section will pass through the Windemere mining district on to Golden, and branches are to be run east and west, connecting the capital of that district with the Upper Wild Horse and Bull River region; also with St. Marys Valley, Kimberly, Skookum Chuck and Tracey Creek, through a coal district. The following directors were elected on Sept. 4: R. L. T. Galbraith, J. A. Harvey, Jas. T. Laidlaw, A. C. Nelson, Dr. J. H. King and Dr. Hugh Wait. (Construction Supplement, March 8, 1901.)

Manitoulin & North Shore.—A survey is reported north from Owen Sound, and J. H. Clergue, the contractor, expects to be able to locate the route of this new road by Oct. 1. (July 26, p. 540.)

Marshalltown & Dakota.—It is said that this line, which now has 26 miles in operation in Iowa between Fraser, Ogden and Gowrie, will be extended from the last named place through the western part of the State to Sioux City.

Michigan Roads.—An officer denies that the Chicago & Grand Trunk and Pere Marquette are to build a joint belt line track around the city of Lansing, as currently stated in press reports. (Sept. 13, p. 644.)

New York Roads.—The contract to survey a short line on Staten Island, from a connection with the Rapid Transit road at Annadale to Richmond Beach, has been let to Civil Engineer H. C. Van Emburgh, and work is to begin at once.

Northern Pacific.—Contract has been let to Nelson & White, of Seattle, for the Green River Branch, which is a spur five miles long running in King County, Wash., to reach timber interests.

North Shore & Manitoulin.—Three lines of trial surveys have been run between Owen Sound and Meaford and Georgian Bay, Ont., 22 miles east. The central line almost parallels the present stage route, and is the shortest, but has heavy grades. The line which will probably be used is the northern survey, which is the longest of the three, but almost without grades, and passes through the towns of Leith, Annan and Balaclava.

Nova Scotia Roads.—The Nova Scotia Government has signed a contract with Mackenzie & Mann for the construction of a line of railroad from Halifax to Barrington, with a branch from New Germany to Caledonia Corners, a distance of about 200 miles.

Pacific & Idaho Northern.—Work is said to have been begun on the extension of the line from Council to Landore, Idaho, 20 miles, into the Seven Devils' Mining District. (Aug. 2, p. 554.)

Panhandle & Gulf.—Contracts have been let for the first 25 miles of the Colorado, Texas & Mexico portion of this line, from Abilene, Texas, north, and work was to have begun Sept. 15. The northern connection of this line is not known at the present time.

Pike Run.—This company has been incorporated in Pennsylvania to build a road six miles long from Coal Center to Greenlee Mills, Washington County. Capital, $60,000. The President is P. J. Forsyth, of Coal Center.

Pittsburgh & Lake Erie.—Contracts have been let to Thomas McNally to grade the new yards of the company at Hazleton, near Youngstown, Pa. The yards are to be about a mile and a half long, and have an average width of 600 ft., to accommodate about 50 tracks, and the total cost is expected to be about $250,000.

Rio Grande, Sierra Madre & Pacific.—It is said that this line will be extended into the mountains very soon, from Casas Grandes, Mexico.

St. Louis Southwestern.—An officer writes that survey has been completed and work is in progress on an extension of the Paragould Southeastern, from Hornersville to Chicasaba, 14 miles. The Paragould Southeastern is at present in operation between Paragould, Ark., and Hornersville, Mo., 25 miles east. Work is also in progress on the Pine Bluff-Arkansas River, from English to Bayou Meto, Ark., six miles.

Santa Fe Central.—Surveys are reported completed between Santa Fe, N. Mex., and Chameleon Station, on the Rock Island, 116 miles. The route is said to be through a country of easy grades and it is thought the cost of construction will be comparatively light.

Santa Fe, Prescott & Phoenix.—The contract for grading the Big Bug Branch of the Bradshaw Mountain road from Huron Station to the Poland mine, about eight miles in a southerly direction, has been let to Grant Bros., of Los Angeles, and work was to have begun Sept. 10.

Surveys are reported in progress on a new line up the Gila and San Pedro Rivers to Benson, Ariz., from Florence, a distance of about 150 miles east and southeast. The line was surveyed from Phoenix to Florence several years ago, and from Florence on to Tucson.

Shreveport & Red River Valley.—It is said that a branch will be built from the main line to Winnfield, La., 28 miles, and that contracts for grading have been let to Epple & Hayes, of Alexandria, La. (Sept. 13, p. 644.)

South Georgia.—An officer writes that on Oct. 1, the extension from Quitman, Ga., 22 miles south to Greenville, Fla., on the Seaboard Air Line, will be open for business.

Syracuse, Skaneateles & Moravia.—Permission has been given by the Railroad Commissioners to this company to build their line between the points named. The route includes the towns of Solvay, Camillus, Marcellus and Mottville, and is about 43 miles long.

United States & West India.—A railroad by this name is under survey around Tampa Bay, Fla., from Tampa to Braidentown, about 50 miles.

Vera Cruz & Pacific.—The contract for the Vera Cruz branch, from Tierra Blanca, on the main line, to the port of Vera Cruz has been let to Hampson & Smith. The distance is about eighty miles and the contractors agree to complete the work by June 15, 1902. The Vera Cruz & Pacific road is to run from Cordova, Mexico, to a point on the Isthmus of Tehuantepec. It is completed and in operation from Cordova to the Plalaopam River.

Victoria, Vancouver & Eastern.—It is said that this company will build as far as Midway, B. C., from Grand Forks; about 23 miles along the International boundary. (March 15, p. 194.)

Washington Roads.—Articles of incorporation have been filed in Colville, Wash., for a railroad and steamboat line from some point on the Spokane Falls & Northern in Stevens County, Wash., down the Columbia River. The capital stock is $500,000, and the incorporators are: Julius Pohle, Colville; W. B. Aris and Geo. S. Morley, Meyers Falls, and George W. Krebs, New York.

West Coast.—An officer writes that grading has been completed 10 miles south from Greenville, on this Florida road, projected from Greenville south 250 miles to Tampa, by way of Perry. A branch also is proposed from Perry to Deadmans Bay, 40 miles. (Construction Supplement, March 8, 1901.)

Whitehall & Granville (Electric).—This proposed line from Whitehall, N. Y., southeast to West Pawlet, Vt., with a branch from Truthville, N. Y., to the Hatch Hill quarries, is reported already under contract, except the branch, to the Dispatch Construction Co., of Chicago, and grading for 6 miles has been completed. The Granville & Poultney Co., chartered in Vermont, will build a connecting line adjoining the above road, in Granville. This route will extend via Lake St. Catharine, Vt., and through a slate quarrying district to Poultney, Vt., 10 miles, and it is desired to open negotiations with contractors for the construction of this road. (Official.)

Yellow River.—This line, now in operation between Crestview, Fla., on the Louisville & Nashville, and Florala, Ala., on the State line, is to be extended between Laurel Hill and Wingo, Ala., 15 miles. W. B. Wright, of Pensacola, Fla., is Vice-President.

RAILROAD NEWS.

Boston & Maine.—On Oct. 9, the shareholders will vote on ratifying the lease of the Fitchburg, and also on a proposed issue of $1,000,000 in bonds for improvements upon their leased lines.

Chicago Great Western.—This company assumed control and management of the Winona & Western, Sept. 12. The Winona & Western runs in a southerly direction from Winona, Minn., to Osage, Iowa, 113 miles, and is projected as far as Omaha, Neb.

Denver & Rio Grande.—At the annual meeting of the stockholders, Oct. 15, a proposition will be submitted to amend the articles of incorporation, by specifying and describing therein the route of the new standard gage line of railroad of the company between La Veta and Alamosa, over La Veta Pass on the Sangre de Cristo range of mountains in Colorado, and to authorize the building of this line.

Eel River.—See Logansport & Toledo.

International & Great Northern.—Permission has been applied for to the Railroad Commission to register an issue of $540,000 bonds on the new extension in course of completion between Calvert and Bryan, Tex.

Logansport & Toledo.—Incorporated as successor to the Eel River in the interest of the Pennsylvania. The Eel River, extending from Logansport, Ind., northeast to Butler, 94 miles, has been sold by order of court. The Eel River was at one time operated by the Wabash.

Norfolk & Western.—The annual meeting of the stockholders will be held Oct. 10, and at that time the purchase of the railroad, property and franchises of the Cincinnati, Portsmouth & Virginia will be considered.

Chicago & North Western.—The final document conveying the Sioux City & Pacific to this company was filed in Woodbury County, Iowa, Sept. 4. The Chicago & North Western is to assume payment of $4,000,000 in bonds issued by the Sioux City & Pacific, Aug. 1, and also of the first mortgage of that date. The Northwestern also agrees to purchase at any time within a year common and preferred stock which may be held by any shareholders of the road at $100 per share for common, and $200 per share for preferred stock.

Ozark & Cherokee Terminal.—This road is said to have secured control of the Shawnee, Oklahoma & Missouri, a western corporation chartered to build west from Muscogee, Ind. T., which has begun work.

Richmond, Fredericksburg & Potomac.—An agreement has been made between the Pennsylvania, the Baltimore & Ohio, the Chesapeake & Ohio, Southern Railway, Seaboard Air Line, and the Atlantic Coast Line railroad companies, providing for the incorporation of a Richmond-Washington Company, by which the above-named companies have acquired each one-sixth of the entire capital stock of the Washington Southern Railway Company (whose line begins at the south end of the Long Bridge across the Potomac, and ends at Quantico) and one-sixth of the majority of the voting capital stock of the Richmond, Fredericksburg & Potomac Railroad Co. Under this agreement, and certain supplementary arrangements, the Washington Southern Railway will be operated by the Richmond, Fredericksburg & Potomac Railroad Co. on and after November 1 next. Each company, however, preserves its entity, and its property is to be operated for the benefit of its stockholders as heretofore. A continuous line of operation will thus be established between Richmond and Washington, and over this line the traffic of the above-named railroad companies is to be moved and facilities granted with impartiality.

Western Maryland.—An offer of $8,000,000 has been made Mayor Hayes, of Baltimore, for the city's interest in this road which owns a line between Baltimore and Williamsport, Md., 90 miles, and also controls 162 miles of leased line in that locality.